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FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING AND QUALITY ASSURANCE PROJECT PLANS) JUNE 2011 FOR FACILITY INVESTIGATION SOLID WASTE MANAGEMENT UNIT 29 (SWMU29) PCP DIP TANK BUILDING 56 AREA NSA CRANE IN
7/1/2011
TETRA TECH

FINAL
SAMPLING AND ANALYSIS PLAN
(FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN)
JUNE 2011

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI)
SWMU 29 – PCP DIP TANK, BUILDING 56 AREA

NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

Naval Facilities Engineering Command Midwest

Contract Number N62470-08-D-1001

Contract Task Order F27N

July 2011

SAP Worksheet #1 -- Title and Approval Page

(UFP-QAPP Manual Section 2.1)

FINAL
SAMPLING AND ANALYSIS PLAN
(FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN)
JUNE, 2011

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI)
SWMU 29 - PCP DIP TANK, BUILDING 56 AREA
NAVAL SUPPORT ACTIVITY (NSA) CRANE
CRANE, INDIANA

Prepared for:
Naval Facilities Engineering Command Midwest
201 Decatur Avenue, Building 1A
Great Lakes, Illinois 60088

Prepared by:
Tetra Tech NUS, Inc.
234 Mall Boulevard, Suite 260
King of Prussia, Pennsylvania 19406
610-491-9688

Prepared under:
Contract No. N62470-08-D-1001
Contract Task Order F27N

Investigative Organization's Project Manager:________________________________
Signature/Date
Joseph H. Lucas, QEP, Tetra Tech NUS, Inc.

Investigative Organization's Project Quality Assurance (QA) Manager:

____
Signature/Date
Tom Johnston, PhD, Tetra Tech NUS, Inc.

Approval Signatures:

____
Signature/Date
Thomas J. Brent/NAVFAC PWD Crane ERSM/Date
NSA Crane Environmental Restoration Site Manager

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Signature/Date
Doug Griffin/RPM
Indiana Department of Environmental Management

____
Signature/Date
Navy Chemist Janice L. Nielsen
NAVFAC QA Review

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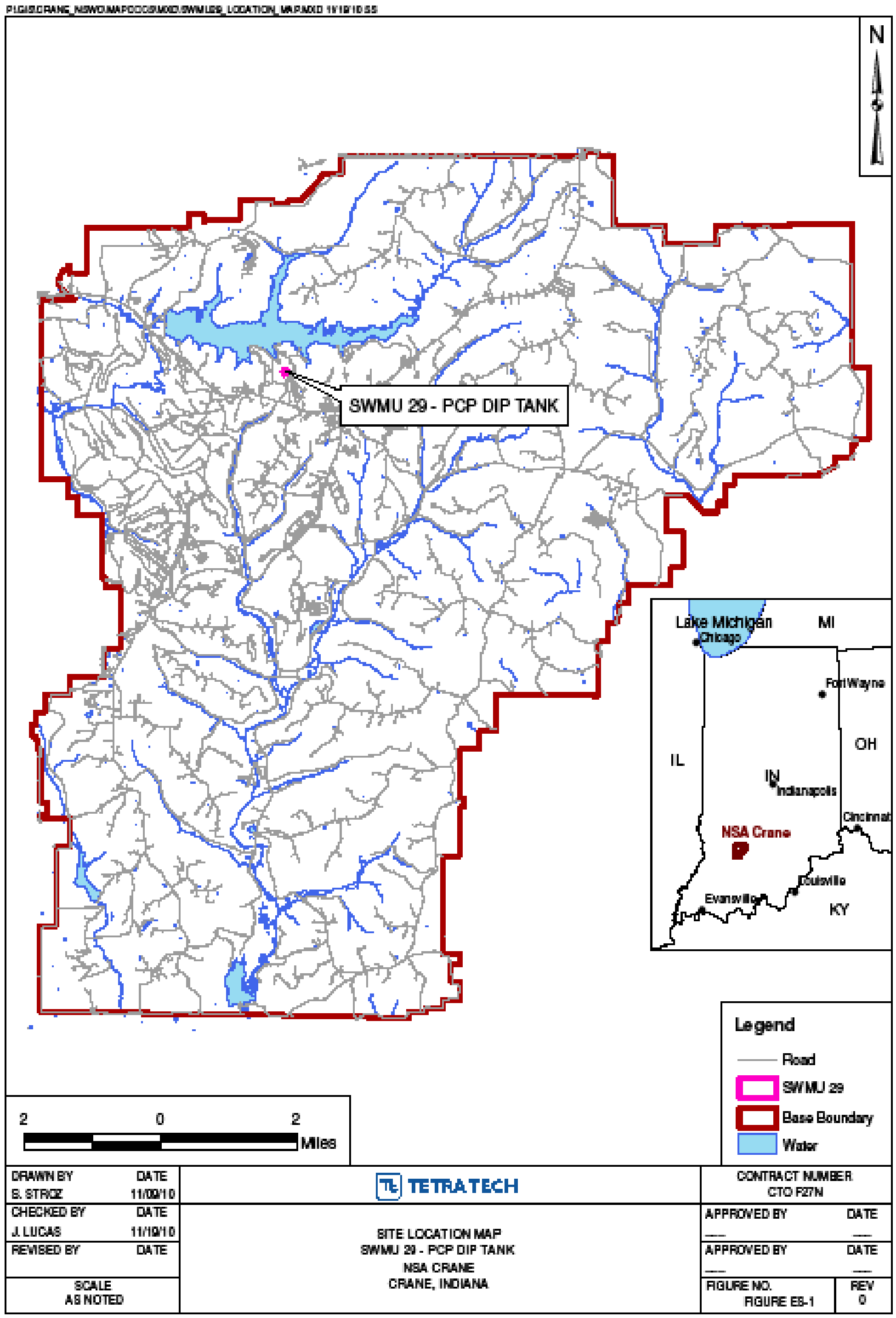
EXECUTIVE SUMMARY

Tetra Tech NUS, Inc. (Tetra Tech) has prepared this Sampling and Analysis Plan (SAP) for a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at Solid Waste Management Unit (SWMU) 29, the pentachlorophenol (PCP) Dip Tank, Naval Support Activity (NSA) Crane, Indiana. The SAP for the SWMU 29 RFI at NSA Crane was developed under Contract Task Order (CTO) F276, Contract N62470-08-D-1001, Comprehensive Long-Term Environmental Action Navy (CLEAN). Figure ES-1 shows the locations of the NSA Crane installation and of SWMU 29 within the installation perimeter. SWMU 29 (PCP Dip Tank) is contained within the boundary of NSA Crane and is located in the northern portion of the base. Although called the PCP Dip Tank, the dip tank at SWMU 29 was removed in 1965. For the purposes of this SAP, the PCP Dip Tank will be referred to as the "former PCP Dip Tank". SWMU 29 includes the location of the former PCP Dip Tank and the surrounding area (see Figure ES-2).

The former PCP Dip Tank was located approximately 100 feet northwest of the northern end of Building 56. The tank was used for dipping untreated wood into PCP. NSA Crane personnel indicated that the tank leaked PCP.

This RFI, which is planned to occur in phases, will begin with surface and subsurface soil sampling to determine if PCP contamination is in the soil near the location of the former tank. The first phase of the RFI includes analyses of soil for PCP, PCP degradation products, manufacturing impurities, and chemicals included in formulation of PCP dip dank solutions. If contamination is found, the decision logic in this SAP will be applied to determine whether additional sampling of soil or other matrices such as groundwater are required. When the RFI is completed, an RFI Report will be prepared to describe the nature and extent of contamination at SWMU 29, if any; the pathways/mechanisms for contaminant migration; and the risks to receptors that are potentially exposed to contamination.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Fort Wayne
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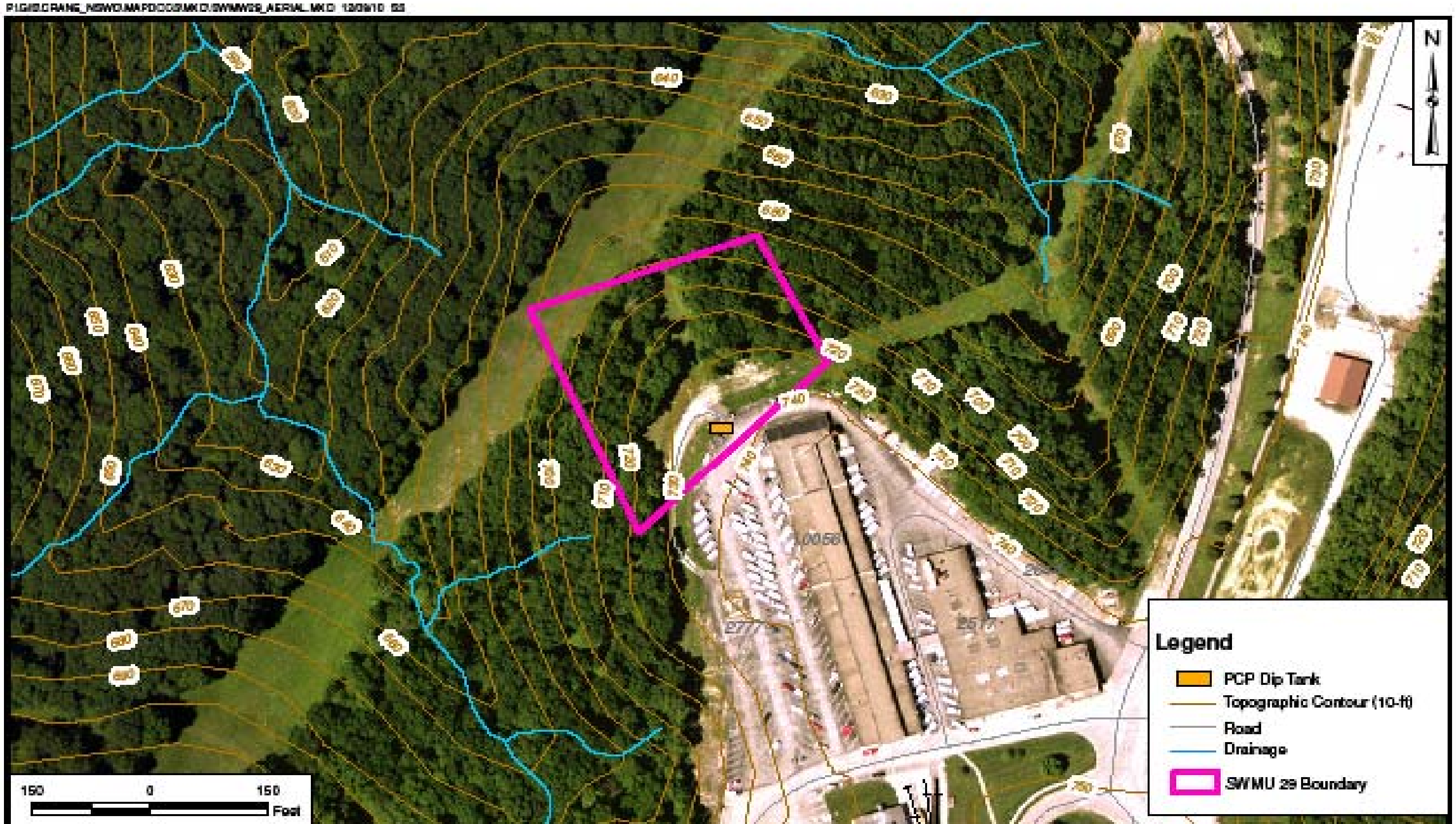


DRAWN BY S. STROZ	DATE 12/06/10	TETRA TECH	CONTRACT NUMBER CTO F27N	
CHECKED BY J. LUCAS	DATE 12/07/10	SWMU 29 - PCP DIP TANK NSA CRANE CRANE, INDIANA	APPROVED BY	DATE
REVISED BY S. STROZ	DATE 12/08/10		APPROVED BY	DATE
SCALE AS NOTED			FIGURE NO. FIGURE ES-2	REV 0

SAP Worksheets

List of Figures

List of Appendices

ACRONYMS

ºC	degrees Celsius
AR	Administrative Record
bgs	below ground surface
CA	Corrective Action
CAS	Chemical Abstracts Service
CEC	Cation Exchange Capacity
CFA	Cape Fear Analytical, LLC
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
CMS	Corrective Measures Study
COPC	chemical of potential concern
CSM	conceptual site model
CTO	Contract Task Order
DL	Detection limit
DO	dissolved oxygen
DoD	Department of Defense
DPT	direct-push technology
DQI	Data Quality Indicator
DQO	Data Quality Objective
DVM	Data Validation Manager
EDD	Electronic Data Deliverable
ELAP	Environmental Laboratory Accreditation Program
EPC	exposure point concentrations
ERSM	Environmental Restoration Site Manager
FID	Flame Ionization Detector
FOL	Field Operations Leader
FTMR	Field Task Modification Request
GC/MS	Gas Chromatography/Mass Spectroscopy
GPS	Global Positioning System
HASP	Health and Safety Plan
HI	hazard index
HSM	Health and Safety Manager
ICAL	Initial Calibration
ICB	Initial Calibration Blank
ID	identification

I-DCL	Industrial Default Closure Level
IDEM	Indiana Department of Environmental Management
IDW	investigation-derived waste
ISA	Initial Site Assessment
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	Limit of Detection
LODV	Limit of Detection Verification
LOQ	Limit of Quantitation
MCL	Maximum Contaminant Level
MDL	Minimum Detection Limit
mg/kg	milligram per kilogram
MS	matrix spike
MSD	matrix spike duplicate
NA	Not Applicable
NAVFAC	Naval Facilities Engineering Command
NEESA	Naval Energy and Environmental Support Activity
NELAP	National Environmental Laboratory Accreditation Program
NFA	No Further Action
NIRIS	Naval Installation Restoration Information Solution
NSA	Naval Support Activity
OSHA	Occupational Safety and Health Administration
PCP	pentachlorophenol
PID	photo ionization detector
PM	Project Manager
POC	Point of Contact
PPE	personal protective equipment
ppm	part per million
PQO	project quality objective
PSL	Project Screening Level
QA	quality assurance
QAM	Quality Assurance Manager
QAMS	Quality Assurance Management System
QAO	Quality Assurance Officer
QC	quality control
QL	Quantitation Limit
RA	Removal Action

RBSSL	Risk-Based Soil Screening Level
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RPD	Relative Percent Difference
RPM	Remedial Project Manager
R-RSL	Residential Regional Screening Level
RTI	RTI Laboratories, Inc.
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
SSO	Site Safety Officer
SWMU	Solid Waste Management Unit
TBD	to be determined
TCL	Target Compound List
Tetra Tech	Tetra Tech NUS, Inc.
UCL	Upper Confidence Limit
UFP-SAP	Uniform Federal Policy for Sampling and Analysis Plan
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency

SAP Worksheet #2 -- SAP Identifying Information

(UFP-QAPP Manual Section 2.2.4)

Site Name/Number:	Naval Support Activity **(**NSA) Crane/Solid Waste Management Unit (SWMU) 29 Pentachlorophenol (PCP) Dip Tank
Operable Unit:	Not Applicable (NA)
Contractor Name:	Tetra Tech NUS, Inc. (Tetra Tech)
Contract Number:	N62470-08-D-1001
Contract Title:	Comprehensive Long-term Environmental Action Navy (CLEAN)
Work Assignment Number:	Contract Task Order (CTO) F27L

1. This Sampling and Analysis Plan (SAP) was prepared in accordance with the requirements of the *Uniform Federal Policy for Quality Assurance Plans (UFP-QAPP)* (United States Environmental Protection Agency[USEPA, 2005a]) and *EPA Guidance for Quality Assurance Project Plans,* EPA QA/G-5, QAMS (USEPA, 2002).

2. Identify regulatory program: The Indiana Department of Environmental Management (IDEM) Hazardous Waste Closure and Corrective Action Programs, which implement and enforce the Resource Conservation and Recovery Act (RCRA), and related state laws and rules.

3. This SAP is a project-specific SAP.

4. List dates of scoping sessions that were held:

Scoping Session	Date
Data Quality Objective (DQO) Meeting – Participants included Tetra Tech, NSA Crane, and IDEM	12/15/2010

5. List dates and titles of any SAP documents written for previous site work that are relevant to the current investigation.

Title	Date
There are no SAP documents for previous site work at SWMU 29.	NA

6. List organizational partners (stakeholders) and connection with lead organization:

IDEM (regulatory oversight), Naval Facilities Engineering Command (NAVFAC) Midwest (property owner), Tetra Tech (Navy contractor)

7. Lead organization: NAVFAC

8. If any required SAP elements or required information are not applicable to the project or are provided elsewhere, then note the omitted SAP elements and provide an explanation for their exclusion below:

There are no exclusions.

SAP Worksheet #3 -- Distribution List

(UFP-QAPP Manual Section 2.3.1)

Name of SAP Recipients	Title/Role	Organization	Telephone Number	E-mail Address or Mailing Address
Peter Ramanauskas	USEPA Remedial Project Manager (RPM)/Provides USEPA overnight	USEPA Region 5	312-866-7890	ramanauskas.peter@epa.gov
Doug Griffin	State RPM/Provides state input	IDEM	317-233-2710	dgriffin@idem.in.gov
Howard Hickey	Technical Representative/ Backup RPM	NAVFAC Midwest	847-688-2600 X243	howard.hickey@navy.mil
Tom Brent	RPM/Environmental Restoration Site Manager (ERSM)/ Provides support and manages this project and serves as the NSA Crane Point of Contact (POC)	NAVFAC Public Works Department (PWD) NSA Crane	812-854-6160	tom.brent@navy.mil
Bonnie Capito (Final Letter Only)	Administrative Record (AR) Librarian/ Manages AR for NAVFAC	NAVFAC Atlantic	757-322-4785	bonnie.capito@navy.mil
Joseph Lucas, QEP	Project Manager (PM)/ Manages Project Activities	Tetra Tech	412-921-8882	joe.lucas@tetratech.com
Ralph Basinski	Crane Activity Coordinator/ Coordinates Tetra Tech activities at NSA Crane	Tetra Tech	412-921-8308	ralph.basinski@tetratech.com
TBD	Field Operations Leader (FOL)/ Manages Field Operations	Tetra Tech	TBD	TBD
Tom Johnston, PhD (electronic copy only)	Quality Assurance Manager (QAM)/ Manages Corporate Quality Assurance (QA) Program and Implementation	Tetra Tech	412-921-8615	tom.johnston@tetratech.com
Matt Soltis [Health and Safety Plan (HASP) only]	Project Health and Safety Manager (HSM)	Tetra Tech	412-921-8912	matt.soltis@tetratech.com

Name of SAP Recipients	Title/Role	Organization	Telephone Number	E-mail Address or Mailing Address
Joe Samchuck	Data Validation Manager (DVM)/Responsible for oversight of data validation activities.	Tetra Tech	412-921-8856	joe.samchuck@tetratech.com
Edward Sedlmyer	Project Chemist/ Responsible for resolving analytical issues.	Tetra Tech	412-921-8704	ed.sedlmyer@tetratech.com
TBD	Site Safety Officer (SSO)/ Oversees site activities to ensure that safety requirements are met	Tetra Tech	TBD	TBD
TBD	Field Operations Technician/ Performs field sampling activities	Tetra Tech	TBD	TBD
Fred Hoitash	Laboratory PM/ Representative for laboratory and analytical issues	RTI Laboratories, Inc. (RTI)	734-422-8000	fhoitash@rtilab.com
Chris Cornwell	Laboratory PM/ Representative for laboratory and analytical issues	Cape Fear Analytical, LLC (CFA)	910-795-0421	Chris.Cornwell@CFAnalytical.com

SAP Worksheet #4 -- Project Personnel Sign-Off Sheet

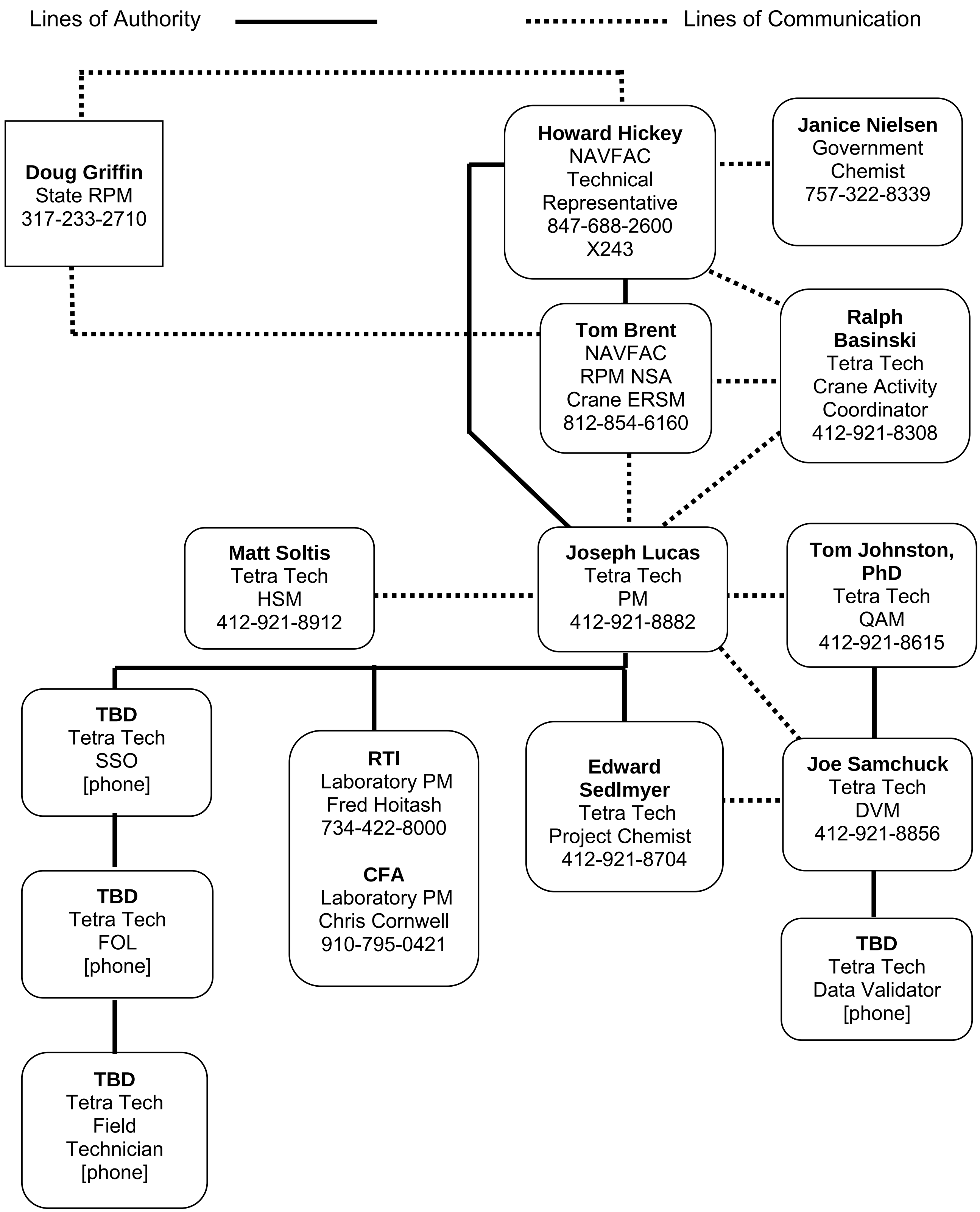
(UFP-QAPP Manual Section 2.3.2)

Key personnel will be instructed to read the SAP prior to attending an internal site-specific kick-off meeting for field activities. The Tetra Tech PM will track when the reviews have been completed, obtain signatures, and ensure that the completed sign-off sheet is included in the central project file.

Name	Organization/Title/Role	Telephone Number	Signature/email receipt	SAP Section Reviewed	Date SAP Read
TBD	Tetra Tech/ FOL/ Manages Field Operations	TBD		All	
TBD	Tetra Tech/ SSO/ Oversees site activities to ensure that safety requirements are met	TBD		All	
Ralph Basinski	Tetra Tech/ Crane Activity Coordinator/ Coordinates Tetra Tech activities at NSA Crane	412-921-8308		All	
Edward Sedlmyer (Electronic copy only)	Tetra Tech/ Project Chemist/ Conducts data validation and reporting and provides support for laboratory- related issues	412-921-8704		All	
Joe Samchuck (Electronic copy only)	Tetra Tech/ DVM/ Oversees data validation activities	412-921-8510		Worksheet #s 12, 14, 15, 19, 20, 23-28, 30, and 34-37	
Fred Hoitash (Electronic copy only)	RTI/ Laboratory PM/ Manages project for Laboratory	734-422-8000		Worksheet #s 12, 14, 15, 19, 20, 23-28, 30, and 34 to 36	
Chris Cornwell (Electronic copy only)	CFA/ Laboratory PM/ Manages project for Laboratory	910-795-0421		Worksheet #s 12, 14, 15, 19, 20, 23-28, 30, and 34 to 36	

SAP Worksheet #5 -- Project Organizational Chart

(UFP-QAPP Manual Section 2.4.1)



SAP Worksheet #6 -- Communication Pathways

(UFP-QAPP Manual Section 2.4.2)

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or e-mail	Procedure
SAP amendments	Tetra Tech PM Tetra Tech FOL NAVFAC PWD NSA Crane RPM/ERSM	Joseph Lucas, QEP TBD Tom Brent	412-921-8882 TBD 812-854-6160	Tetra Tech FOL will verbally inform Tetra Tech PM within 24 hours of realizing a need for an amendment/addendum. Tetra Tech PM will document the proposed changes via a Field Task Modification Request (FTMR) form within 5 days and, if necessary, send the Navy RPM a concurrence letter within 7 days of identifying the need for change. UFP-SAP amendments will be submitted by Tetra Tech PM to NAVFAC RPM for review and approval. Tetra Tech PM will send scope changes to Project Team via e-mail within 1 business day.
Schedule changes	Tetra Tech PM NAVFAC PWD NSA Crane RPM/ERSM Tetra Tech FOL	Joseph Lucas, QEP Tom Brent TBD	412-921-8882 812-854-6160 TBD	Tetra Tech will verbally inform the NSA Crane ERSM on the day that the day that the schedule change is known.

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or e-mail	Procedure
Field issues that require changes in field tasks	Tetra Tech FOL Tetra Tech PM NAVFAC PWD NSA Crane RPM/ERSM	TBD Joseph Lucas, QEP Tom Brent	TBD 412-921-8882 812-854-6160	Tetra Tech FOL informs PM verbally the day the issue is realized. PM informs the NAVFAC RPM of the issue verbally within 1 day of the FOL's notification. PM also sends a concurrence letter to NAVFAC within 7 days, if project scope is affected. The NAVFAC RPM will sign the letter within 5 days of receipt. Document changes on a FTMR form. Place the form in the project file, with signatures as determined by the PM.
Field issues that require changes in scope of field work	Tetra Tech FOL Tetra Tech PM NAVFAC PWD NSA Crane RPM/ERSM	TBD Joseph Lucas, QEP Tom Brent	TBD 412-921-8882 812-854-6160	Tetra Tech FOL informs PM verbally the day the issue is realized. PM informs the NAVFAC RPM of the issue verbally within 1 day of the FOL's notification. PM also sends a concurrence letter to the NAVFAC RPM within 7 days, if project scope is affected. The NAVFAC RPM will sign the letter within 5 days of receipt. Document changes on an FTMR form. Place the form in the project file, with signatures as determined by the PM.
Initial Round of Samples Sent to the Laboratory	Tetra Tech Project Chemist	Ed Sedlmyer	412-921-8704	The Project Chemist verifies verbally with the laboratory the correct sample analysis sequence as presented in this SAP.

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or e-mail	Procedure
Recommendations to stop work and then to initiate work upon corrective action implementation	Tetra Tech FOL Tetra Tech PM NAVFAC Technical Representative NAVFAC PWD NSA Crane RPM/ERSM Tetra Tech HSM Tetra Tech QAM Tetra Tech Project Chemist	TBD Joseph Lucas, QEP Howard Hickey Tom Brent Matt Soltis Tom Johnston, PhD Ed Sedlmyer	TBD 412-921-8882 847-688-2600 x243 812-854-6160 412-921-8912 412-921-8615 412-921-8704	If Tetra Tech is the responsible party for a stop-work command, the Tetra Tech person recognizing the need to stop work will inform the PM who will inform the project personnel, including subcontractor(s), the Navy RPM and base POC, and the identified Project Team members within 1 hour (verbally or by e-mail). If a subcontractor is the responsible party, the subcontractor PM must inform the Tetra Tech FOL within 15 minutes, and the Tetra Tech FOL will then follow the procedure listed above.

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or e-mail	Procedure
Field or laboratory data quality issues	RTI Laboratory PM CFA Laboratory PM Tetra Tech FOL Tetra Tech PM Tetra Tech Project Chemist Tetra Tech DVM	Fred Hoitash Chris Cornwell TBD Joseph Lucas, QEP Ed Sedlmyer Joe Samchuck	734-422-8000 910-795-0421 TBD 412-921-8882 412-921-8704 412-921-8510	The Laboratory PM will notify (verbally or via e-mail) the Tetra Tech Project Chemist within one business day of when an issue related to laboratory data is discovered. The Tetra Tech Project Chemist will notify (verbally or via e-mail) the data validation staff and the Tetra Tech PM within one business day. Tetra Tech DVM or Project Chemist notifies Tetra Tech PM or Tetra Tech FOL verbally or via e-mail within 48 hrs of validation completion that a non-routine and significant laboratory quality deficiency has been detected that could affect this project and/or other projects. The Tetra Tech PM verbally advises the NAVFAC RPM within 24 hours of notification from the project chemist or DVM. The NAVFAC RPM takes corrective action that is appropriate for the identified deficiency. Examples of significant laboratory deficiencies include data reported that has a corresponding failed mass spectrometer tune or initial calibration verification. Corrective actions may include a consult with the NAVFAC Navy Chemist.
Corrective action for field program	Tetra Tech QAM Tetra Tech PM	Tom Johnston, PhD Joseph Lucas, QEP	412-921-8615 412-921-8882	Tetra Tech QAM will notify (verbally or via e-mail) Tetra Tech PM within one business day that the corrective action has been completed. The Tetra Tech PM will then notify (verbally or via e-mail) the Navy RPM within 1 business day.

SAP Worksheet #7 -- Personnel Responsibilities and Qualifications Table

(UFP-QAPP Manual Section 2.4.3)

Name	Title/Role	Organizational Affiliation	Responsibilities
Tom Brent	NAVFAC PWD NSA Crane RPM/ERSM/ Provides support and manages this environmental project and serves as the base POC	NAVFAC NSA Crane	Oversees and coordinates site activities, participates in scoping, data review, and evaluation, and approves the SAP.
Doug Griffin	IDEM RPM/ Provides state input	IDEM	Participates in project scoping and implementation, including data review and evaluation, and approves the SAP.
Joseph Lucas, QEP	PM/ Manages project activities on a daily basis	Tetra Tech	Manages project for NAVFAC. Oversees project, financial, schedule, and technical day-to-day management of the project.
Ralph Basinski	Crane Activity Coordinator/ Coordinates activities at NSA Crane	Tetra Tech	Coordinates Tetra Tech activities at NSA Crane.
TBD	FOL/ Manages field operations	Tetra Tech	Supervises, coordinates, and performs field sampling activities.
TBD	SSO/ Oversees site activities to ensure that safety requirements are met	Tetra Tech	Responsible for training and monitoring site conditions. The SSO reports to the HSM and to the Tetra Tech PM. Details of the SSO's responsibilities are presented in the Health and Safety Plan (HASP).
Tom Johnston, PhD	QAM/ Oversees program and project QA activities	Tetra Tech	Reviews SAP, oversees preparation of laboratory scope, and conducts data quality reviews. Ensures quality aspects of the CLEAN program.
Joseph Samchuck	DVM/ Oversees data validation activities	Tetra Tech	Manages data validation activities within Tetra Tech, including ensuring QA of data validation deliverables, providing technical advice on data usability, and coordinating and maintaining the data validation review schedule.
Matt Soltis	HSM/ Oversees health and safety activities	Tetra Tech	Oversees CLEAN Program Health and Safety Program.

Name	Title/Role	Organizational Affiliation	Responsibilities
Ed Sedlmyer	Project Chemist/ Coordinates laboratory-related functions and conducts data validation and reporting	Tetra Tech	Participates in project scoping, prepares laboratory scopes of work, and coordinates laboratory-related functions with laboratory, including those identified in Worksheet #6. Conducts data quality reviews and QA of data validation deliverables.
Fred Hoitash	Laboratory PM/ Manages project for RTI	RTI	Coordinates analyses with laboratory chemists, ensures that scope of work is followed, provides QA of data packages, and communicates with Tetra Tech project staff.
Chris Cornwell	Laboratory PM/ Manages project for CFA	CFA	Coordinates analyses with laboratory chemists, ensures that scope of work is followed, provides QA of data packages, and communicates with Tetra Tech project staff

SAP Worksheet #8 -- Special Personnel Training Requirements Table

(UFP-QAPP Manual Section 2.4.4)

Each site worker will be required to have completed appropriate Hazardous Waste Operations and Emergency Response (HAZWOPER) training specified in Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.120 (e). Project-specific safety requirements are addressed in greater detail in the site-specific HASP.

SAP Worksheet #9 -- Project Scoping Session Participants Sheet

(UFP-QAPP Manual Section 2.5.1)

Project Name: SWMU 29 Projected Date(s) of Sampling: October 2011 Project Manager: Joseph Lucas		Site Name: SWMU 29 - PCP Dip Tank Site Location: NSA Crane, Crane, Indiana			
Date of Session: **Scoping Session Purpose:**					
Name	**Title**	**Affiliation**	**Phone #**	**E-mail Address**	**Project Role**
Joseph Lucas, QEP	PM	Tetra Tech	412-921-8882	joe.lucas@tetratech.com	Management
Tom Brent	NAVFAC PWD NSA Crane RPM/ERSM	NAVFAC PWD	812-854-6160	thomas.brent@navy.mil	Management
Doug Griffin	IDEM RPM	IDEM	317-233-2710	dgriffin@idem.in.gov	State RPM
Ralph Basinski	Crane Activity Coordinator	Tetra Tech	412-921-8308	ralph.basinski@tetratech.com	Management/ Oversight

Comments/Decisions:

Prior to the Scoping Session, a site walk was conducted at SWMU 29 to see the location of the former PCP Dip Tank and observe current conditions at the site. No additional information was available regarding operations at the former PCP Dip Tank.

The proposed sampling plan identifies the target parameters to be PCP and dioxins/furans. Commercial PCP is known to contain trace amounts of certain dioxin and furan congeners. Recognizing that dioxins/furans analysis is expensive, a recommendation was made to first screen soil samples to see if they contain PCP. If PCP is detected in a sample, then that sample would also be submitted for dioxins/furans analysis. Soil samples could be tested in the field using PCP Immunoassay Field Kits. It was also suggested that PCP may have degradation by-products and that these degradation by-products should be identified and also included in the list of target parameters for this field investigation.

The sampling plan will include a biased sampling design for soil. Geo-probe soil borings will be collected at nine locations; one upgradient of the dip tank location (southeast), one at the center of the tank location, one at each corner of the tank location, and 3 downgradient (northwest) of the tank location. There will be two soil samples per boring; one surface sample (0-2 feet bgs) and one subsurface sample (> 2 feet bgs) that will be screened either using an FID or a PCP Immunoassay Test Kit to determine which boring subsurface sample will be submitted.

Action Items:

Tetra Tech will submit the draft SAP to Navy Crane for review and comment. Navy Crane comments will be addressed and the SAP will be revised as needed. The revised SAP will then be submitted to the Navy Chemist for review and comment.

Consensus Decisions:

Proceed with preparation of the draft UFP-SAP as discussed and implement recommendations presented at the meeting.

Follow-up discussion between Joe Lucas and Tom Johnston, March 15, 2011:

Use of PCP test kits to delineate PCP contamination in the field was considered at length. The benefits of this approach (real time data collection and the ability to guide sample collection in the field) were balanced against the added costs of writing a more complicated SAP to describe the field analyses and the fact that the area of interest is small, so the number of sampling locations required for delineation is small. PCP test kits would only be useful for delineation and not for risk assessment because they are not sensitive to all target analytes. Analysis of all soil samples using a fixed based laboratory only would support both delineation and risk assessment. Therefore, the benefits are insufficient to outweigh the costs and potential use of PCP test kits was dismissed. Analysis costs can be controlled by initially selecting for dioxins/furans analysis only the samples that exhibit the greatest PCP concentrations. If the dioxins/furans concentrations exceed applicable dioxins/furans screening values, additional dioxins/furans analyses would be required. To support this analysis scheme, the holding times from sample collection date to sample extraction for dioxins/furans analysis will be allowed to extend to 3 months without qualification of the data. This extended holding time is allowed by the analysis method, SW-846 Method 8290A.

SAP Worksheet #10 -- Conceptual Site Model

(UFP-QAPP Manual Section 2.5.2)

This worksheet presents general background information about SWMU 29 – PCP Dip Tank and a conceptual site model (CSM) that describes potential contamination routes and possible exposure pathways. The CSM served as the basis for developing the sampling and analysis program

10.1 PHYSICAL SITE DESCRIPTION

SWMU 29 is located in the north central portion of NSA Crane approximately one-half mile south of Lake Greenwood (see Figure 10-1). The site covers approximately 1.6 acres. This SWMU is currently inactive and contains no structures. During the period 1950 through 1965, NSA Crane operated a PCP wood preservation dip tank near Building 56 and there is no security fencing around SWMU 29. The former PCP dip tank (19 feet [ft] x 7 ft x 4 ft) was presumably made from carbon steel and had an aluminum lid. The former tank was located approximately 60 ft northwest of Building 56 (see Figure 10-2). The tank sat on a concrete pad (see Figure 10-3). The PCP Dip Tank was removed in 1965. It appears that the tank was used to treat wooden pallets that were used at NSA Crane.

Most of NSA Crane is forested including the areas west, north, and east of the site. The nearest largest body of water is Lake Greenwood approximately 1,500 feet to the northwest of SWMU 29. There are also small streams located west and northeast of the site as shown in Figure 10-2. The southernmost extent of SWMU 29 is on a plateau, while the western, northern, and eastern sides of the site slope gently to lower elevations.

NSA Crane is in the unglaciated Crawford upland physiographic province of southern Indiana, which is a rugged dissected plateau bordered on the west by the Wabash lowland and on the east by the Mitchell plain. Bedrock geology is mapped as Pennsylvanian and Mississippian sandstones, limestones, and shales overlain by Quaternary-age deposits. Groundwater flow in the area generally mimics topography. Because there are no groundwater wells at SWMU 29, the depth to groundwater is unknown.

The NSA Crane facility was a rural, forested, and farmed area when it was commissioned as a Navy facility in 1941; the site has been part of the Navy facility since that time. There are no known historical or cultural concerns, such as Native American burial grounds or historic landmarks on or in the vicinity of the site. There are no land use controls (LUCs) associated with the SWMU 29.

10.2 SWMU 29 HISTORY

There are significant information gaps regarding site-specific operations of the tank. For example, there is no documentation regarding the wood treating process, frequency of operation, PCP solution formulation, and reported leaks (location, date, duration, quantity of solution, etc). The former PCP Dip Tank was supposedly used to treat wooden pallets. It is assumed that PCP solution was released to the environment via tank leaks and/or during process steps that may have allowed PCP solution to drip on to the adjacent soil during removal of the treated wood from the solution. If the leaks were large enough, it is possible that some of the PCP solution may have drained beyond the adjacent soil and down the slope located west of the PCP tank.

A literature search was conducted to identify chemicals potentially associated with wood preservation operations. Technical grade PCP has been noted to contain small amounts of impurities such as tetrachlorophenol, trichlorophenols, dichlorophenols, polychlorodiphenyl ethers, polychlorophenoxy phenols, chlorinated hydrocarbons, polychlorinated dioxins and furans, and hexachlorobenzene as manufacturing by-products. In addition, oils (e.g., P-9 oil, kerosene, No. 2 fuel oil, or mineral spirits), which contain polycyclic aromatic hydrocarbons (PAHs) are commonly mixed with the technical-grade PCP to produce the dip tank solution.

10.3 PREVIOUS ENVIRONMENTAL INVESTIGATIONS AND ACTIONS

An initial site assessment (ISA) of the dip tank was conducted in 1983. The purpose of the ISA was to identify and assess sites posing a potential threat to human health or the environment due to contamination from past hazardous materials operations. The former PCP Dip Tank location was evaluated with regard to contamination characteristics, migration pathways, and pollutant receptors. The ISA inspection revealed that there was no vegetation stress, soil staining, or other evidence confirming a PCP leak and recommended no further action.

In 1987, a Preliminary Review and Visual Site Inspection was conducted at SWMU 29 to identify and evaluate the potential for releases to the environment of PCP and the need for further actions. The results of the Review/Inspection Report recommended that soil should be sampled in the location of the former tank to verify the conclusions of the ISA Study

10.4 CONCEPTUAL SITE MODEL

Tank leaks and operating practices are sources of potential contamination at SWMU 29. These leaks were reported by personnel, but there is no documentation regarding the date and time, exact location of the leaks, and duration. Also, there is no documentation regarding operating practices. However, it is assumed that treatment solution may have dripped from the Dip Tank basket after it was removed from the tank and placed in a staging area next to the tank. During removal of the tank and the concrete pad on which the tank sat, the surface soil may have been redistributed, thus spreading contamination laterally and working contamination deeper into the soil.

10.4.1 Potential Sources and Contaminants of Concern

Based on historical information, leaks occurred at the former PCP Dip Tank. Because the composition of the treatment solution is unknown, a literature search was conducted to identify chemicals potentially associated with wood preservation operations.

Technical grade pentachlorophenol (typically 86 percent pure) has been used in large quantities since the 1930s, primarily as a wood preservative, to prevent the growth of microbes or infestation by wood boring insects. Impurities of environmental significance commonly found at low concentrations in technical grade PCP include the following:

- P-9 Oil
- Kerosene
- No. 2 Fuel Oil
- Mineral Spirits
- 1,2-Dichlorobenzene
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- Pentachlorobenzene
- 1,2,4-Trichlorobenzene
- Phenol
- 2,4-Dichlorophenol
- 2,3,4,6-Tetrachlorophenol
- 2,4,5-Trichlorophenol
- 2,4,6-Trichlorophenol
- 4-Chlorophenyl phenyl ether
- Hexachlorobenzene
- 2-Chlorophenol
- 1,2,4,5-Tetrachlorobenzene
- chlorinated dibenzodioxins
- chlorinated dibenzofurans
- 1

- 2
- 3

In addition, industrial grade PCP mixtures typically consist of a few (e.g., 5) percent to 80 percent pentachlorophenol in oil (e.g., P-9 oil, kerosene, No. 2 fuel oil, or mineral spirits). PCP is generally considered to be mobile in the soil environment, but its mobility is highly dependent on pH. At higher pH values it is ionized, more soluble in water, and its mobility is greater than at low pH. PCP is moderately persistent in soil, with a reported field half-life of 45 days (Extoxnet, 2011). This half-life is considered to be a very rough estimate and may not reflect the actual half-life because site conditions most likely differ significantly from those under which the half-life was determined. Therefore, the 45-day half-life is considered a lower bound on the actual half-life. PCP sorption is expected to increase in soils with higher proportions of soil organic matter decreasing its mobility. SWMU 29 soil has not been well characterized, but SWMU 16 soil has been characterized (Tetra Tech, 2001). The soil characteristics at SWMU 29 are expected to be similar to those of SWMU 16 because both of these SWMUs are in the area of NSA Crane covered by residual soil derived from Pennsylvanian bedrock/colluvium (Tetra Tech, 2001). The Pennsylvanian bedrock underlying the soil overburden contains black shales, carbonaceous shales, and coal. Based on background samples, the Pennsylvanian soils consist of clay, silt, sand, and fragmented and/or partially weathered bedrock. The overburden depth has been reported to range from 0 (i.e., bedrock surface outcroppings) to 60 feet deep or more (Tetra Tech, 2001). Measured soil pH values at SWMU 16 ranged from about 5 to 8, with most soil pH values in the 5.5 to 7.7 range. The soil pH values at SWMU 29 are expected to fall into the 5 to 8 range as well.

Degradation of PCP is considered to occur primarily by anaerobic biodegradation in flooded or anaerobic (airless) soils, at higher temperatures, and in the presence of organic matter in the soil. Known PCP degradation products (ATSDR, 2001) include the following:

- 2,3,5,6-tetrachlorohydroquinone
- 2,3,6-trichlorohydroquinone
- 2,4,6-Trichlorophenol
- 2,6-Dichlorophenol
- 2.6-Dichlorohydroquinone
- 2-Chloromaleylacetate
- Maleylacetate
- 3-Oxoadipate

10.4.2 Potential Migration and Exposure Pathways

Releases of PCP and other treatment solution contaminants to the environment at SWMU 29, if they occurred, most likely occurred through leaks of the dip tank or spills during treatment operations when treatment solution may have dripped onto surface soil during removal of the treated wood. After release to surface soil, PCP can percolate vertically downward during precipitation events into subsurface soil and groundwater and possibly result in a complete exposure pathway to human receptors that could consume groundwater or soil or could make direct dermal contact with these media. PCP in surface soil could flow as overland runoff toward areas of lower elevation, especially within existing surface drainage channels. These channels could then transport the contaminants in surface water and sediment to lower elevations within the channels. PCP degrades readily in shallow surface water when exposed to light. So the persistence of PCP is expected to be short under those conditions. PCP impurities and degradation products would exhibit similar fates but dioxins and furans would be significantly more persistent.

PCP is generally considered to be mobile in the environment, but its mobility is highly dependent on pH, being least mobile under conditions of high pH and organic content. PCP is moderately persistent in soil, with a reported field half-life of 45 days (Extoxnet, 2011). PCP sorption is expected to increase in soils with higher proportions of soil organic matter decreasing its mobility.

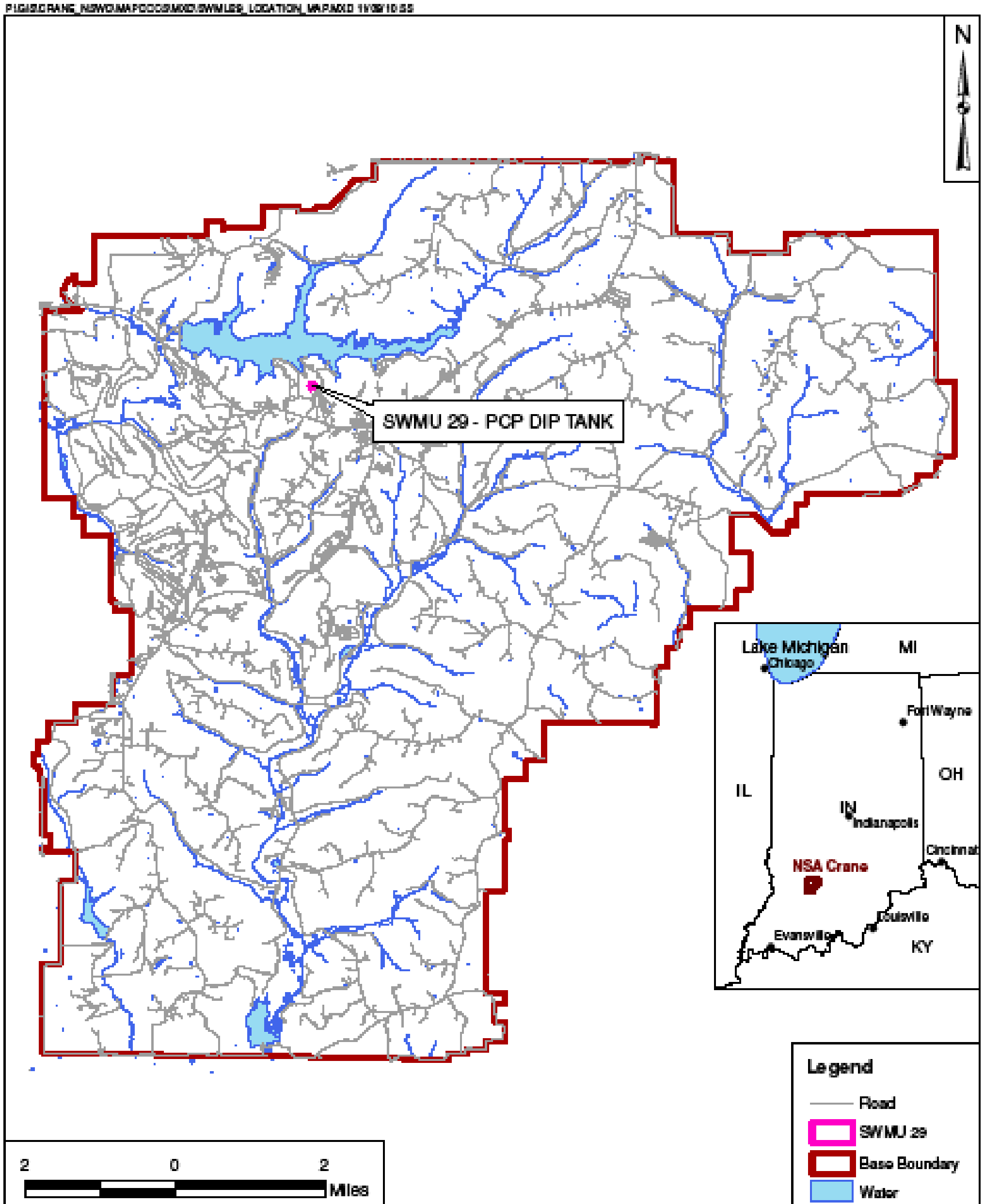
PCP degradation is considered to occur primarily by anaerobic biodegradation in flooded or anaerobic (airless) soils, at higher temperatures, and in the presence of organic matter in the soil. Decomposition products produced during this process include acetates, polychlorinated phenols, hydroquinones, and 3-oxoadipate.

10.4.3 Potential Receptors

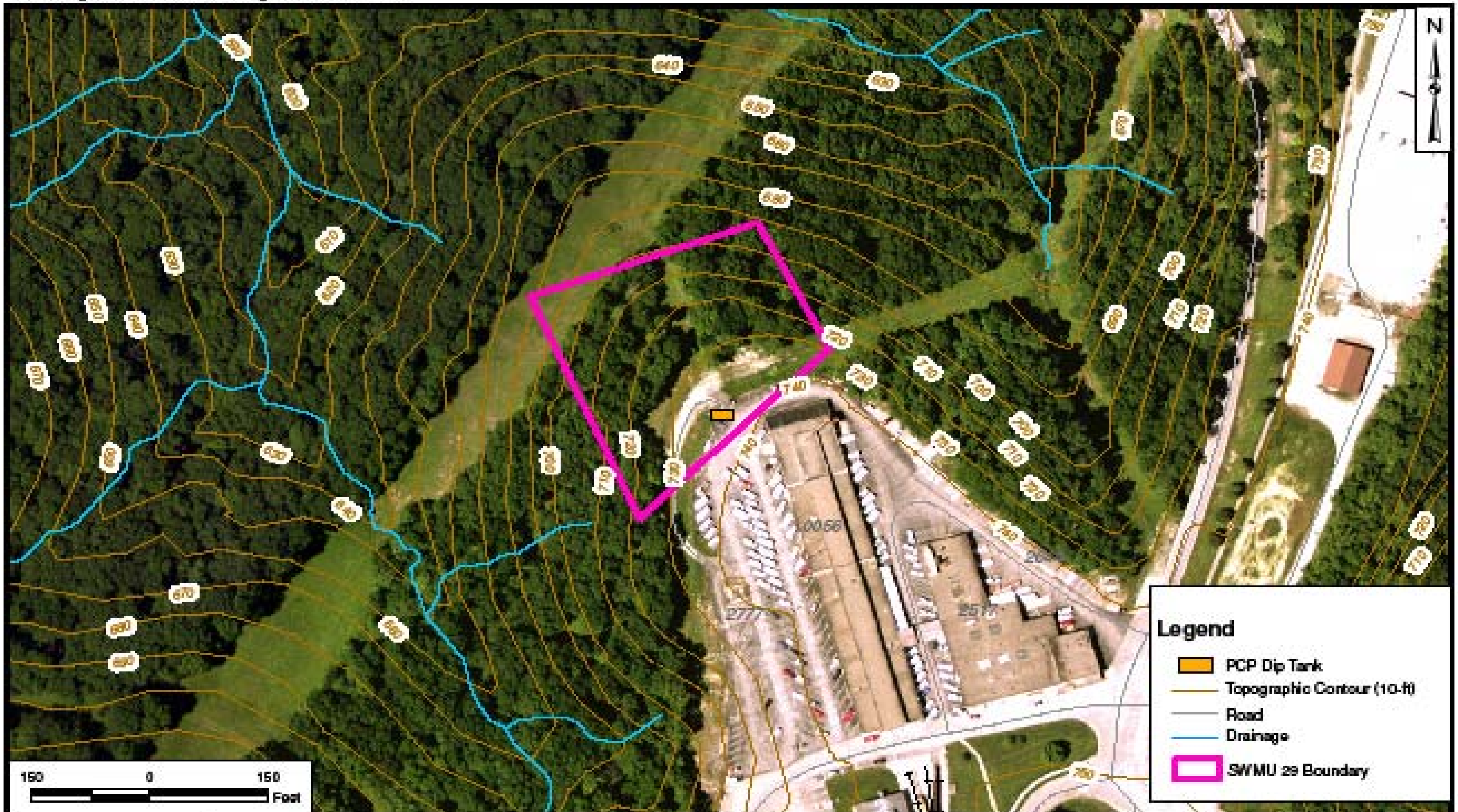
Human receptors at SWMU 29 include people who currently, or could in the future, interact with contaminated media. Current site users include NSA Crane industrial or construction workers and trespassers. The area is rural, and there are no residential areas within a mile of the site. However, because future land use is unknown, it is customary to evaluate the future use of the property as residential. Therefore, potential future receptors at SWMU 29 include hypothetical future residents and persons recreating at the site. Human receptors may be exposed to different media based on their specific activities. These media include surface and subsurface soil, and groundwater.

Ecological receptors include invertebrates and plant species that could be affected by the contaminants that are present at the site. At SWMU 29, ecological receptors can be exposed only to surface soil media. Exposure of ecological receptors to groundwater and subsurface soil is not anticipated; however, contamination in subsurface soil or groundwater may serve as sources of contamination to sediment or surface water through subsurface transport or diffuse flow to streams. Terrestrial plants, invertebrates, and vertebrates are exposed to surface soil by direct contact and ingestion of soil and other food items.

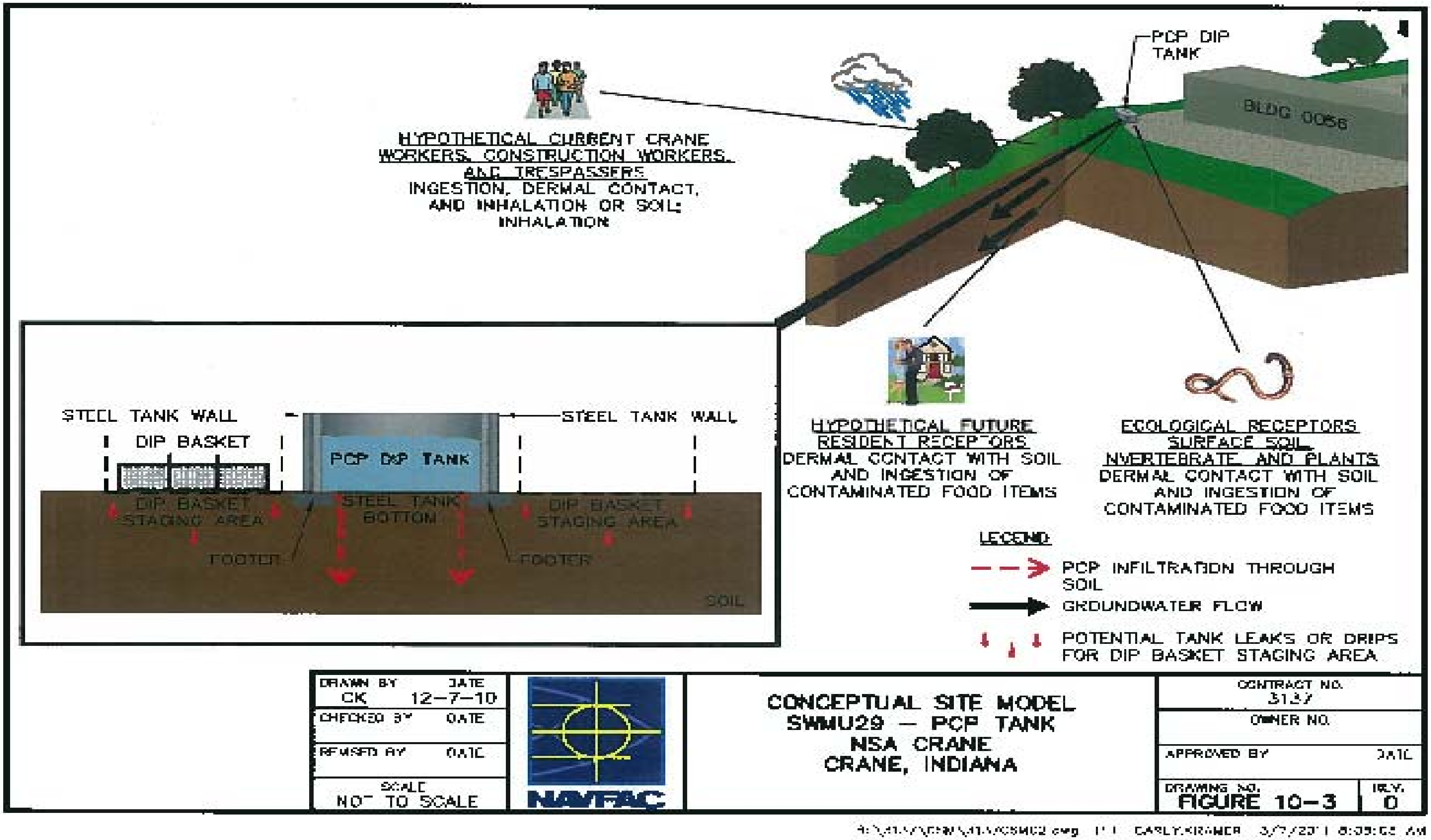
A schematic illustration of the CSM for SWMU 29 is shown on Figure 10-3.



DRAWN BY S. STROZ	DATE 11/09/10	TETRA TECH	CONTRACT NUMBER CTO F27N	
CHECKED BY J. LUCAS	DATE 11/09/10	SITE LOCATION MAP SWMU 29 - PCP DIP TANK NSA CRANE CRANE, INDIANA	APPROVED BY	DATE
REVISED BY	DATE		APPROVED BY	DATE
SCALE AS NOTED			FIGURE NO. FIGURE 10-1	REV 0



DRAWN BY S. STROZ DATE 12/06/10	TETRA TECH	CONTRACT NUMBER CTO F27N
CHECKED BY J. LUCAS DATE 12/07/10	SWMU 29 - PCP DIP TANK NSA CRANE CRANE, INDIANA	APPROVED BY ___ DATE ___
REVISED BY S. STROZ DATE 12/08/10		APPROVED BY ___ DATE ___
SCALE AS NOTED		FIGURE NO. FIGURE 10-2 REV 0


PCP DIP TANK
BLDG 0056
HYPOTHETICAL CURRENT CRANE WORKERS, CONSTRUCTION WORKERS, AND TRESPASSERS
INGESTION, DERMAL CONTACT, AND INHALATION OF SOIL; INHALATION
STEEL TANK WALL
DIP BASKET
PCP DIP TANK
STEEL TANK WALL
DIP BASKET STAGING AREA
STEEL TANK BOTTOM
DIP BASKET STAGING AREA
FOOTER
FOOTER
SOIL
HYPOTHETICAL FUTURE RESIDENT RECEPTORS
DERMAL CONTACT WITH SOIL AND INGESTION OF CONTAMINATED FOOD ITEMS
ECOLOGICAL RECEPTORS SURFACE SOIL INVERTEBRATE AND PLANTS
DERMAL CONTACT WITH SOIL AND INGESTION OF CONTAMINATED FOOD ITEMS
LEGEND
PCP INFILTRATION THROUGH SOIL
GROUNDWATER FLOW
POTENTIAL TANK LEAKS OR DRIPS FOR DIP BASKET STAGING AREA
DRAWN BY CK
DATE 12-7-10
CHECKED BY
DATE
REVISED BY
DATE
SCALE NOT TO SCALE
NAVFAC
CONCEPTUAL SITE MODEL
SWMU29 — PCP TANK
NSA CRANE
CRANE, INDIANA
CONTRACT NO. 3137
OWNER NO.
APPROVED BY
DATE
DRAWING NO. FIGURE 10-3
REV. 0

SAP Worksheet #11 -- Project Quality Objectives/Systematic Planning Process Statements

(UFP-QAPP Manual Section 2.6.1)

This section describes the development of PQOs using USEPA's seven-step DQO/Systematic Planning Process.

11.1 PROBLEM DEFINITION

Because it is unknown whether PCP and related contaminants have been released at SWMU 29 as a result of site operations and previous investigative results are unavailable, this investigation must be conducted to determine whether PCP dip tank-related contamination is present at SWMU 29. If contamination is found, the Project Team wants to collect enough data to complete a risk assessment so the results of this investigation will be useful for determining whether subsequent actions commensurate with the identified level of contamination [e.g., conducting a full scale RCRA Facility Investigation (RFI)] are warranted. The Project Team wants to minimize the number of field mobilizations and wants to collect enough data to support risk assessment as soon as possible in the investigative process.

11.2 INFORMATION INPUTS

Because there is no information available regarding the former PCP Dip Tank solution, a literature search was conducted about wood preservation and typical treatment solutions. Results of the literature search are provided below. Use of field test kits for PCP analysis was considered but dismissed because of the limited value it would provide (see Worksheet #9).

The following chemical and physical data are needed to attain project objectives:

1. Laboratory Target Analyte Concentrations: A fixed-base laboratory must be used to quantify soil concentrations of PCP and PCP-related compounds so the data can be used in support of a risk assessment (see bottom of Worksheet #9). The PCP-related compounds of interest are other USEPA Target Compound List (TCL) SVOCs (including PAHs), diesel range organics (DRO), and dioxins/furans. Hereafter, PCP and other SVOCs (including PAHs) are referred to as site-related SVOCs. These target analytes, all of which are potential site contaminants, are listed in Worksheet #15, Table 15.1, 15.3, and 15.4. The sampling methods are presented in Worksheet #18, and the analytical methods are presented in Worksheet #19.

Note: A relatively high degree of uncertainty exists concerning the concentration levels expected for site-related target analytes, especially for PCP and the other SVOCs, which are the contaminants of primary interest. Some samples may require low level analysis for compounds that are not detected and also have quantitation or detection limits that exceed PSLs when analyzed by the normal Method 8270D. These analytes are listed in Worksheet #15, Table 15.2 with a header indicating selected ion monitoring (SIM) analysis. Laboratory progress must be monitored during analyses so that unexpected detections of chemicals can be evaluated by the Project Chemist to determine whether any changes to the analytical scheme are required. The intent is to thoroughly evaluate potential contaminants and quantify site contaminants using the most cost-effective method for each sample, while meeting detection and quantitation limit requirements presented in Worksheet #15 (with exceptions as indicated in Worksheet #15 footnotes).

2. Project Screening Levels (PSLs) (See Worksheet #15): Surface and subsurface soil PSLs are required as a point of comparison for data collected from SWMU 29. The PSLs are the lowest matrix-specific risk-based or regulatory human health and ecological criteria appropriate for the site based on consideration of potential receptors and exposure pathways.

Note: Currently, PSL values are not available for the PCP degradation products listed in Section 10.4.1 unless they are also listed as known PCP impurities (e.g., 2,3,4-trichlorophenol). Because there are no PSL values to which the analytical results of these degradation products can be readily compared and because the presence of site-related contamination is adequately represented by PCP and its impurities, it is not necessary to investigate the PCP degradation compounds to determine whether the site is contaminated. Furthermore, the acetates and 3-oxoadipate are relatively soluble in water and hence they are relatively mobile and are expected to degrade more rapidly than the PCP and PCP impurities. This means the degradation products are less likely to be detectable than PCP and its impurities.

3. Project Action Levels – For human health risk assessment the cancer risk action level is 1E-4 incremental lifetime cancer risk (ILCR) for the hypothetical future resident and the non-cancer risk action level is Hazard index (HI) = 1 (unity), based on common target organ or effect.

Note: All target analyte concentrations less than the Detection Limit (DL) will be considered non-detections; detections reported at concentrations between the DL and Limit of Quantitation (LOQ) will be reported with a “J” qualifier; and target analytes not detected in a sample will be reported as the Limit of Detection (LOD) with a "U" qualifier.

4. Soil Sampling Location Horizontal and Vertical Coordinates and Depths – Sampling location horizontal coordinates may be established using a GPS with sub-meter accuracy or by land surveyor (see Worksheet #14). The datum used for establishing the coordinates of each sample location must

be horizontal NAD83. Depths of soil intervals may be determined by the driller or FOL using tape measure or other suitable measurement tools to obtain depths to the nearest 1 inch.

11.3 STUDY AREA BOUNDARIES

The study includes surface and subsurface soil at the location of the former PCP Dip Tank. The following items establish the horizontal, vertical, and temporal boundaries for the RFI study:

Horizontal: The exposure unit for this study is the area where the former PCP Dip Tank was located just northwest of Building 0056. This exposure unit (EU) is illustrated on Figure 17-1. This exposure unit has an area of approximately 0.05 acres and is comprised of the location of the former PCP Dip Tank, a perimeter zone (1,950 sq ft) where staging of Dip Baskets may have occurred, and an extended area (630 sq ft) on the west side of the tank where spilled solution may have flowed downslope from the tank. This area is small compared to a typical residential exposure unit of 0.5 to 2.0 acres. Because site-related contamination is expected be limited to this small, 0.05-acre EU, risk estimates based on data from this EU, alone, may be overestimates. The location and size of this area were selected on the basis of information from aerial photos and original design drawings and the project team is willing to accept the overestimates of risk for this initial phase of investigation.

Vertical: The vertical boundary of the study includes surface soil (0 to 2-ft bgs) and subsurface soil (2 to 6-feet bgs and 6 to 10-feet bgs) within the study area. Data from surface and subsurface soil around the perimeter and below the location of the former PCP Dip Tank represent soil that may have been impacted by leaks from the tank.

Temporal: If dioxins/furans are not detected in samples contaminated with PCP, it is assumed that site-related dioxin/furan contamination is insignificant or non-existent. Therefore, to the most cost-effective analysis scheme would be to sequence the dioxin/furan analyses by initially analyzing only the samples that are most contaminated with PCP. If dioxin results for these samples exceed the dioxin/furan PSLs, the remaining samples should be analyzed for dioxins/furans to support the risk assessment. Dioxins/furans holding times for this project (from sampling date to extraction) were extended (as allowed by Method 8290A) to support this sequencing of dioxins/furans analysis. Dioxins and furans are stable in overburden soil.

11.4 ANALYTIC APPROACH

The decision rules governing data use are presented in flowchart form on Figure 11-1. These rules incorporate decisions that are designed to sequentially gather more data as the need for more data to support a risk assessment becomes evident. Additional detail concerning the sampling design and rationale are presented in Worksheet #17.

Ideally, perimeter sample concentrations will be less than PSLs; however, the project team may determine that the contamination is bounded well enough at some point before complete delineation is achieved relative to PSLs that no further delineation is necessary to complete a risk assessment. In this case additional samples will not be needed. Factors considered during this evaluation will include the specific target analyte, magnitude of the exceedance(s), spatial distribution of exceedances, and overall projected risk level based on the observed concentrations. The results of site investigation sampling and any limitations placed on the need for additional samples will be reviewed with the Project Team prior to submitting an addendum to this SAP that will outline the necessary follow-up activities.

Note: Risk estimates will be based on exposure point concentrations (EPCs) computed to be the 95 percent upper confidence limit (UCL) on the mean concentration for each chemical of potential concern (COPC), in accordance with current Navy and EPA risk guidance. EPCs will be computed using the most current version of the EPA-sponsored ProUCL software.

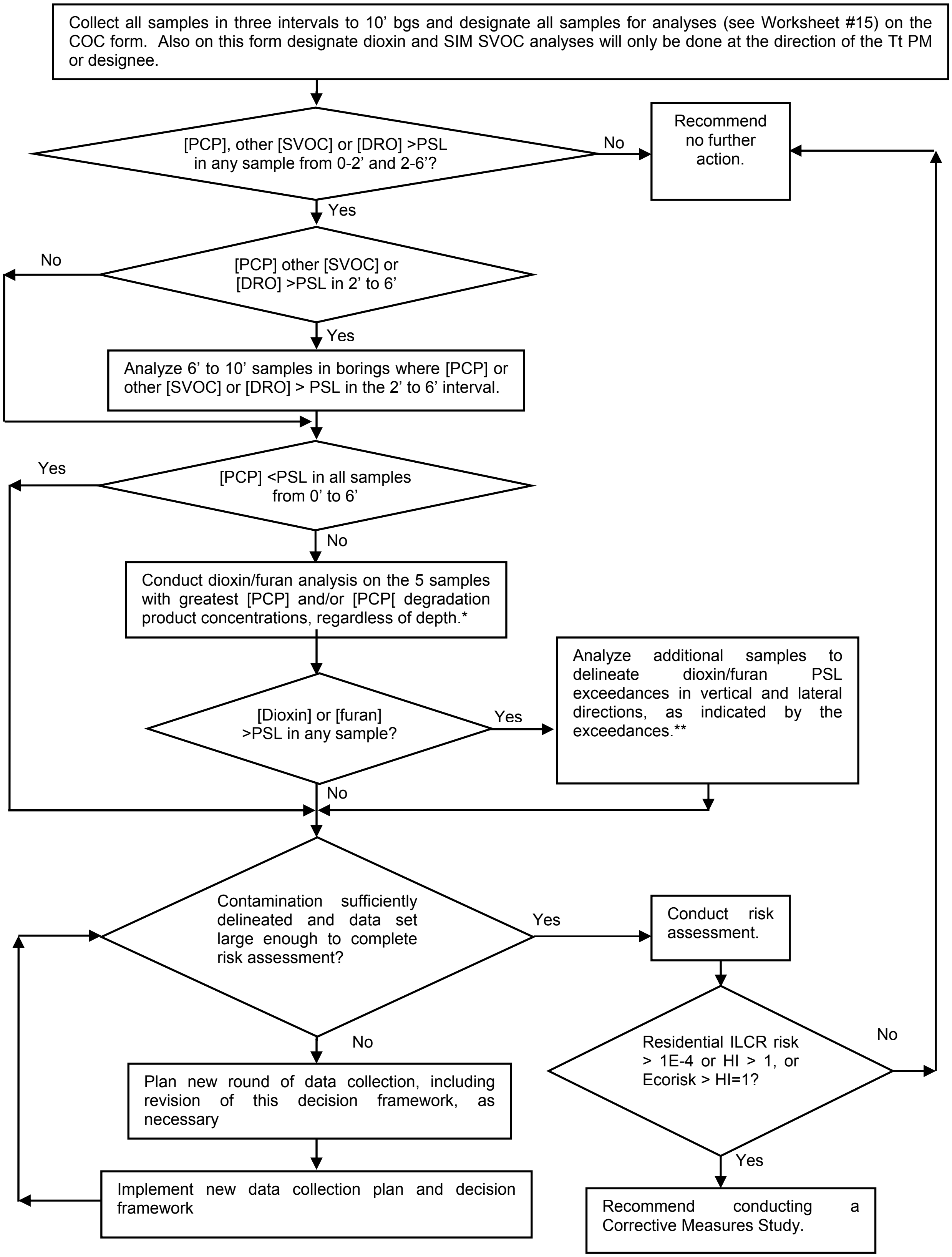
11.5 PERFORMANCE OR ACCEPTANCE CRITERIA

Biased sampling locations were selected to locate potential contamination based on the location of the former PCP Dip Tank. Simple comparisons of measured concentrations to PSLs are initially being used to evaluate how well the extent of contamination has been delineated. The Project Team will use the measured results to determine whether the amount and type of data collected are sufficient to support the attainment of project objectives. This will involve an evaluation of contaminant concentrations and an evaluation of uncertainty for contaminants that have PSLs less than the LODs to ensure that contaminants are likely to have been detected if present. If all data have been collected as planned and no data points are missing or rejected for quality reasons, the sampling event completeness will be considered satisfactory. Data quality review criteria are presented in Worksheets #34 through #37. If any data gaps are identified, including missing or rejected data, the Project Team will assess whether project objectives can be achieved despite the existence of data gaps. This assessment will depend on the number and type of identified data gaps. All Project Team stakeholders will be involved in rendering the final conclusion regarding adequacy of the data.

11.6 SAMPLING STRATEGY

The SWMU 29 study area is small (0.05 acres). This small size lends itself to collecting more data than might be collected under other circumstances with the expectation that the increased sampling in the first round of investigation will reduce the number of future field mobilizations. If target analyte concentrations are not detected in the first round of data collection, no additional rounds of data collection will be needed because the sampling design is rigorous enough in that case to confidently conclude that SWMU 29 does not pose an unacceptable human health or ecological risk. More details of the sampling design and rationale for the collection of RFI field investigation samples is provided in Worksheet #17. The sampling design and rationale for follow-up sampling, if required, will be developed based on the results of the initial sampling phase.

FIGURE 11-1. Decision Logic for Sampling and Analyses.



* If [PCP]<PSL in all samples cancel all dioxin/furan analyses.
**Delineation means to extend vertically or laterally away from the former tank location from any soil interval that had PSL exceedances

SAP Worksheet #12 -- Measurement Performance Criteria Table - Field Quality Control Samples

(UFP-QAPP Manual Section 2.6.2)

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria (MPCs)	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Equipment Rinsate Blank(1)	All fractions	One per 20 field samples per matrix per type of sampling equipment(1)	Bias/ Contamination	No analytes >½ LOQ, except common laboratory contaminants, which must be < LOQ.	S & A
Field Duplicate (FD)	All fractions	One per 20 field samples per matrix	Precision	Values > 5x LOQ: Relative Percent Difference (RPD) ≤50% (solids) (2).	S & A
Cooler Temperature Indicator	All fractions	One per cooler	Representativeness	Temperature must be less than or equal to 6 degrees Celsius (ºC).	S

1 - Equipment rinsate blanks will be collected if non-dedicated sampling equipment is used. For disposable equipment, one sample per batch of disposable equipment will be collected.

2 - If duplicate values are < 5x LOQ, absolute difference should be < 2x LOQ.

SAP Worksheet #13 -- Secondary Data Criteria and Limitations Table

(UFP-QAPP Manual Section 2.7)

Secondary Data	**Data Source** (originating organization, report title and date)	**Data Generator(s)** (originating organization, data types, data generation / collection dates)	**How Data Will Be Used**	**Limitations on Data Use**
None	NA	NA	NA	No secondary data will be used.

SAP Worksheet #14 -- Summary of Project Tasks

(UFP-QAPP Manual Section 2.8.1)

14.1 FIELD INVESTIGATION TASK PLAN

The field tasks are summarized below. A short description of these tasks is also provided.

- Mobilization/demobilization
- Site-Specific Health and Safety Training
- Utility Clearance
- Monitoring Equipment Calibration
- Sample Collection
- Drilling, direct-push technology (DPT) Boring
- Surface and Subsurface Soil Sampling
- Investigation-Derived Waste (IDW) Management
- Global Positioning System (GPS) Locating
- Field Decontamination Procedures
- Field Documentation Procedures
- Sample Custody and Shipment Tasks
- Quality Control

Mobilization/Demobilization

Mobilization will consist of the delivery of all equipment, materials, and supplies to the site, complete assembly in satisfactory working order of all such equipment at the site, and satisfactory storage at the site of all such materials and supplies. Tetra Tech will coordinate with the NSA Crane RPM/ERSM to identify appropriate locations for the storage of equipment and supplies. Site-specific health and safety training for field team will be provided as part of site mobilization. Demobilization will consist of the prompt and timely removal of all equipment, materials, and supplies from the site following completion of the work.

Site-Specific Health and Safety Training

There are no specialized/non-routine project-specific training requirements or certifications needed by personnel to successfully complete the SWMU 29 project. All field personnel will have appropriate training to conduct the field activities to which they are assigned. Safety requirements are addressed in greater detail in the site-specific HASP.

Utility Clearance

One week prior to the commencement of any subsurface intrusive activities, the Tetra Tech FOL or designee will contact Indiana Underground Plant Protection Services (IUPPS) to complete a utility clearance ticket for the area under investigation. Work permits, if required by the facility, will be obtained prior to conducting field activities.

Monitoring Equipment Calibration

Monitoring equipment calibration procedures are described in Worksheet #22.

Sample Collection

Site-specific Standard Operating Procedures (SOPs) have been developed for field activities at NSA Crane, including sample collection tasks (Appendix D). Label samples in accordance with SOP-01 (Sample Labeling), and number the samples in accordance with SOP-02 (Sample Identification and Nomenclature). Record field data in accordance with SOP-03 (Sample Custody and Documentation of Field Activities), and select sample containers, sample preservation, packaging, and shipping conditions in accordance with SOP-08 (Sample Preservation, Packaging, and Shipping).

The sampling and analysis program is outlined in Worksheet #18, and the sampling requirements for each type of analysis (i.e., bottleware, preservation, holding time) are listed in Worksheet #19. Field and laboratory QC samples will be collected as outlined in Worksheet #20.

Drilling, DPT Boring

Pre-determined Geographic Information System (GIS)-grade sample coordinates may be utilized in locating proposed sample locations. DPT (e.g., Geoprobe®) will be used to collect surface and subsurface soil samples from the unconsolidated overburden in accordance with SOP-05. A new acetate liner will be used for each 2-foot section of soil core. The soil core will be visually inspected and logged by the field geologist, and the soil texture, grain size (sand, silt, or clay), color (and any unusual discoloration), moisture content, and soil type will be identified by the field geologist based on the Unified Soil Classification System (USCS). Backfill soil borings with the associated soil cuttings upon completion of sampling.

Surface and Subsurface Soil Sampling

All soil samples will be collected in accordance with SOP-05 (Borehole Advancement and Soil Coring for Soil Sampling Using Direct-Push Technology). Surface soil samples (from 0 to 2 feet bgs) will be collected using a hand auger (or DPT rig at the FOL discretion), and sample jars will be filled using a dedicated disposable plastic trowel. Subsurface soil samples (between 2 and 10 feet bgs) will be collected using a DPT rig. The subsurface soil borings will be described by the FOL Geologist in accordance with SOP-07 (Soil Sample Logging). To support delineation of contamination, divide each boring into three separate units representing the following soil intervals: 0-2 foot, 2-6 foot, and 6-10 foot bgs.

Investigation-Derived Waste Management

It is not anticipated that significant volumes of solid or semi-solid IDW in the form of soil will be generated during field activities, including the collection of subsurface samples using DPT. All IDW that is generated, including personal protective equipment (PPE) and decontamination fluids, will be managed in accordance with SOP-06 (Management of Investigation-Derived Waste).

Global Positioning System Locating

A GPS unit will be used to locate all sampling points in accordance with SOP-09 (Global Positioning System Data Collection and Transfer). The datum to be used for establishing the coordinates of each sample location are horizontal NAD83. The GPS SOP requires a minimum of six satellites to capture a position at sub-meter accuracy. Sample depth intervals will be measured using standard depth measurement techniques based on linear measurements (e.g., tape measure) to the nearest inch or better.

Field Decontamination Procedures

Reusable sampling equipment (e.g., non-disposable hand trowels, hand augers, or DPT or backhoe equipment) will be decontaminated prior to sampling and between samples at each location. Decontamination of equipment will be conducted according to the sequence established in SOP-04 (Decontamination of Field Sampling Equipment).

Field Documentation Procedures

A summary of all field activities will be properly recorded in a bound logbook with consecutively number pages that cannot be removed. Logbooks will be assigned to field personnel and will be stored in a secured area when not in use. The field activities will be documented in accordance with SOP-03 (Sample Custody and Documentation of Field Activity).

Sample Custody and Shipment Tasks

Sample custody and shipment tasks are defined in SOP-08 (Sample Preservation, Packaging, and Shipping) and are discussed in Worksheet #27.

Quality Control Tasks

QA/QC samples will be collected at frequencies listed in Worksheet #12.

14.2 ADDITIONAL PROJECT-RELATED TASKS

Additional project-related tasks include:

- Analytical tasks
- Data generation procedures
- Data Handling and Management
- Assessment and oversight
- Data review
- Project reports

Analytical Tasks

RTI and CFA are current Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) accredited laboratories. Analyses will be performed in accordance with the analytical methods identified in Worksheet #19. RTI and CFA are expected to meet the PSLs to the extent identified in Worksheet #15. RTI and CFA will perform chemical analyses following laboratory-specific SOPs (Worksheet #19 and #23) developed based on the analytical methods listed in Worksheet #19 and #30. Copies of the laboratory SOPs are included in Appendix C.

All solid results will be reported by the laboratory on a dry-weight basis. Results of percent moisture will be reported in each analytical data package and electronic data deliverable (EDD). This information will also be captured in the project database that will eventually be uploaded to the Naval Installation Restoration Information Solution (NIRIS). Percent moisture information will also be included in the RFI Report.

The analytical data packages provided by RTI and CFA will be in a Contract Laboratory Program (CLP)-like format and will be fully validatable and contain raw data. Summary forms for all sample and laboratory method blank data, and summary forms containing all method-specific QC (results, recoveries, RPDs, relative standard deviations, and/or percent differences etc.).

Data Generation Procedures

- Project data documentation and records include the following:
  - Field sample collection and field measurement records as described in Worksheet #s 27 and 29.
  - Laboratory data package deliverables as described in the analytical specifications.
  - Data assessment documents and records as listed in Worksheet #29.

  Data recording formats are described in Worksheet #27.

Data Handling and Management

Data management tasks, including the data handling, tracking, storage, archiving, retrieval, and security processes, are addressed in Worksheet #29.

Assessment and Oversight

Refer to Worksheet #32 for assessment findings and corrective actions and to Worksheet #33 for QA Management Reports.

Data Review

Data verification is described in Worksheet #34, data validation is described in Worksheet #s 35 and 36, and the usability assessment is described in Worksheet #37.

Project Reports

Draft and final versions of project reports will be prepared and submitted to the Navy and IDEM for review. The reports will include the following sections:

- Executive Summary, which will include a brief description of the work conducted and the findings.

- Introduction and Background, which will include a description of the history of operations and activities at the site and a summary of any previous investigations and removal actions.

- Description of Field Investigations, which will include a summary of the work performed in accordance with the approved SAP, any approved SAP addenda, and any field modifications as documented by the Tetra Tech FOL. This section will include maps showing the sampling locations and tables summarizing the data collected.

- Data Quality, which will include a summary of quantitative analytical performance indicators such as completeness, precision, bias, and sensitivity and qualitative indicators such as representativeness and comparability. This section will also include a reconciliation of project data with the DQOs and identification of deviations from this SAP.

  A data usability assessment will be used to identify significant deviations in analytical performance that could affect the ability to meet project objectives. The elements of this review are presented in Worksheet #37.

- Nature and Extent of Contamination – will include a discussion of the contamination detected in each medium sampled in relation to the CSM of the site. This section will note the removals previously conducted, contamination addressed, and any additional contaminants found during this field effort. Detected contaminant concentrations will be tabulated for each medium and depicted on maps.

- Contaminant Fate and Transport, which will include a description of the contaminants detected and their behavior in soil and groundwater, particularly with emphasis on the future migration of these contaminants to any possible exposure areas.

- Human Health Risk Assessment – includes a comparison of data collected to PSLs to identify COPCs. If COPCs are identified they will be assessed in accordance with Risk Assessment for Superfund (RAGS) and contaminants of concern (COCs) will be identified if risk is unacceptable.

- Ecological Risk Assessment, which includes a comparison of data collected to PSLs to identify COPCs. If COPCs are identified they will be assessed and COCs will be identified if risk is unacceptable.

- Summary and Conclusions, which will include a summary of the findings, conclusions as to whether delineation of contamination is adequate, and recommendations for further investigations, if needed.

The final version of the report will submitted in hardcopy and electronic format to the project stakeholders.

SAP Worksheet #15 -- Reference Limits and Evaluation Table

(UFP-QAPP Manual Section 2.8.1)

Note: Project action levels are documented in Section 11.2, bullet number 3.

Table 15.1
Matrix: Soil
Analytical Group: Site-related SVOCs

Analyte	CAS Number	Minimum HH PSL (mg/kg)	Minimum Eco PSL (mg/kg)	HH PSL[1] Reference	Eco PSL[1] Reference	Project Quantitation Limit Goal (PQLG) (mg/kg)	RTI LOQ (mg/kg)	RTI LOD (mg/kg)	RTI DL (mg/kg)
Pentachlorophenol	**87-86-5**	**0.028**	**2.1**	**IDEM-RDCL**	**Eco SSL**	**0.0093**	**0.16**	**0.083**	**0.038587**
1,2,4,5-Tetrachlorobenzene	95-94-3	1.02	2.02	RBSSL	NOAA	0.34	0.16	0.0167	0.01
1,2,4-Trichlorobenzene	**120-82-1**	**0.136**	11.1	**RBSSL**	**Reg 5**	**0.045**	**0.16**	**0.017**	**0.0084**
1,2-Dichlorobenzene	95-50-1	7.2	2.96	RBSSL	Reg 5	1	0.16	0.017	0.0047
1,3-Dichlorobenzene	541-73-1	2.3	37.7	IDEM-RDCL	Reg 5	0.77	0.16	0.017	0.0055
1,4-Dichlorobenzene	**106-46-7**	**0.0082**	**0.546**	**RBSSL**	**Reg 5**	**0.0027**	**0.16**	**0.017**	**0.0049**
2,3,4,6-Tetrachlorophenol	58-90-2	134	0.199	RBSSL	Reg 5	0.066	0.16	0.0167	0.01
2,4,5-Trichlorophenol	95-95-4	250	14.1	IDEM-RDCL	Reg 5	4.7	0.16	0.017	0.010885
2,4,6-Trichlorophenol	**88-06-2**	**0.07**	**9.94**	**IDEM-RDCL**	**Reg 5**	**0.023**	**0.16**	**0.017**	**0.012329**
2,4-Dichlorophenol	120-83-2	1.1	87.5	IDEM-RDCL	Reg 5	0.37	0.16	0.017	0.011311
2,6-Dichlorophenol	87-65-0	1.1	1.17	IDEM-RDCL	Reg 5	0.37	0.16	0.017	0.0053
2-Chlorophenol	95-57-8	0.75	0.243	IDEM-RDCL	Reg 5	0.081	0.16	0.017	0.006646
Hexachlorobenzene	**118-74-1**	**0.0106**	**0.199**	**RBSSL**	**Reg 5**	**0.0035**	**0.16**	**0.017**	**0.007128**
Pentachlorobenzene	608-93-5	4.4	0.497	RBSSL	Reg 5	0.17	0.16	0.017	0.0099
Phenol	108-95-2	56	120	IDEM-RDCL	Reg 5	18.7	0.16	0.017	0.008863

Analyte	CAS Number	Minimum HH PSL (mg/kg)	Minimum Eco PSL (mg/kg)	HH PSL[1] Reference	Eco PSL[1] Reference	Project Quantitation Limit Goal (PQLG) (mg/kg)	RTI LOQ (mg/kg)	RTI LOD (mg/kg)	RTI DL (mg/kg)
2,4-Dimethylphenol	**105-67-9**	**9**	**0.01**	**IDEM-RDCL**	**Reg 5**	**0.003**	**0.16**	**0.017**	**0.022911**
2,4-Dinitrophenol	**51-28-5**	**0.29**	**0.0609**	**IDEM-RDCL**	**Reg 5**	**0.02**	**0.83**	**0.083**	**0.164852**
2,4-Dinitrotoluene	**121-14-2**	**0.0058**	**1.28**	**RBSSL**	**Reg 5**	**0.0019**	**0.16**	**0.017**	**0.007401**
2,6-Dinitrotoluene	**606-20-2**	**1**	**0.0328**	**RBSSL**	**Reg 5**	**0.011**	**0.16**	**0.017**	**0.009168**
2-Chloronaphthalene	**91-58-7**	**42**	**0.0122**	**IDEM-RDCL**	**Reg 5**	**0.0041**	**0.16**	**0.017**	**0.006673**
2-Methylphenol (o-Cresol)	95-48-7	14	40.4	IDEM-RDCL	Reg 5	4.7	0.16	0.017	0.006527
2-Nitroaniline	88-74-4	0.67	74.1	IDEM-RDCL	Reg 5	0.22	0.32	0.017	0.008112
2-Nitrophenol	88-75-5	1.64	1.6	RBSSL	Reg 5	0.53	0.16	0.017	0.005376
3-Methylphenol (m-Cresol)	108-39-4	9.8	3.49	IDEM-RDCL	Reg 5	1.2	0.16	0.033	0.01189
3-Nitroaniline	99-09-2	NA	3.16	NA	Reg 5	1	0.32	0.017	0.011657
4,6-Dinitro-2-methylphenol	**534-52-1**	**0.106**	**0.144**	**RBSSL**	**Reg 5**	**0.035**	**0.32**	**0.083**	**0.042594**
4-Chloro-3-methyl phenol	59-50-7	86	7.95	RBSSL	Reg 5	2.65	0.16	0.017	0.005733
4-Chloroanaline	**106-47-8**	**0.0028**	**1.1**	**RBSSL**	**Reg 5**	**0.00093**	**0.16**	**0.017**	**0.008925**
4-Methylphenol (p-Cresol)	106-44-5	1.1	163	IDEM-RDCL	Reg 5	0.37	0.16	0.033	0.01189
4-Nitroaniline	100-01-6	0.028	21.9	RBSSL	Reg 5	0.0093	0.32	0.017	0.006499
4-Nitrophenol	100-02-7	NA	5.12	NA	Reg 5	1.7	0.83	0.33	0.106398
Carbazole	86-74-8	5.9	NA	IDEM-RDCL	NA	2	0.16	0.017	0.006414
Dibenzofuran	132-64-9	4.9	NA	IDEM-RDCL	NA	1.6	0.16	0.017	0.004209
Nitrobenzene	**98-95-3**	**0.00158**	**1.31**	**RBSSL**	**Reg 5**	**0.00053**	**0.16**	**0.017**	**0.010349**
N-Nitrosodiphenylamine	86-30-6	1.5	0.545	RBSSL	Reg 5	0.18	0.16	0.017	0.00464
Low Level PAHs									
2-Methylnaphthalene	91-57-6	3.1	29	IDEM-RDCL	Eco SSL	1	0.033	0.0067	0.00093

Analyte	CAS Number	Minimum HH PSL (mg/kg)	Minimum Eco PSL (mg/kg)	HH PSL[1] Reference	Eco PSL[1] Reference	Project Quantitation Limit Goal (PQLG) (mg/kg)	RTI LOQ (mg/kg)	RTI LOD (mg/kg)	RTI DL (mg/kg)
Acenaphthene	83-32-9	130	29	IDEM-RDCL	Eco SSL	9.7	0.033	0.0067	0.0005
Acenaphthylene	208-96-8	18	29	IDEM-RDCL	Eco SSL	6	0.033	0.0067	0.0009
Anthracene	120-12-7	1700	29	RBRSL	Eco SSL	9.7	0.033	0.0067	0.0005
Benzo(a)anthracene	56-55-3	0.15	1.1	RBRSL	Eco SSL	0.05	0.033	0.0067	0.0032
Benzo(a)pyrene	**50-32-8**	**0.015**	**1.1**	**RBRSL**	**Eco SSL**	**0.005**	**0.033**	**0.0067**	**0.00096**
Benzo(b)fluoranthene	205-99-2	0.15	1.1	RBRSL	Eco SSL	0.05	0.033	0.0067	0.00084
Benzo(g,h,i)perylene	191-24-2	170	1.1	RBRSL	Eco SSL	0.37	0.033	0.0067	0.0007
Benzo(k)fluoranthene	207-08-9	1.5	1.1	RBRSL	Eco SSL	0.37	0.033	0.0067	0.0013
Chrysene	218-01-9	15	1.1	RBRSL	Eco SSL	0.37	0.033	0.0067	0.00077
Dibenzo(a,h)anthracene	**53-70-3**	**0.015**	**1.1**	**RBRSL**	**Eco SSL**	**0.005**	**0.033**	**0.0033**	**0.00075**
Fluoranthene	206-44-0	230	29	RBRSL	Eco SSL	9.7	0.033	0.0067	0.00088
Fluorene	86-73-7	170	29	IDEM-RDCL	Eco SSL	9.7	0.033	0.0067	0.0011
Indeno(1,2,3-c,d)pyrene	193-39-5	0.15	1.1	RBRSL	Eco SSL	0.05	0.033	0.0067	0.00075
Naphthalene	**91-20-3**	**0.0094**	**29**	**RBSSL**	**Eco SSL**	**0.0031**	**0.033**	**0.0067**	**0.001**
Phenanthrene	85-01-8	13	29	IDEM-RDCL	Eco SSL	4.3	0.033	0.0067	0.00065
Pyrene	129-00-0	340	1.1	RBRSL	Eco SSL	0.37	0.033	0.0067	0.00047

Notes:

CAS – Chemical Abstracts Service
mg/kg – milligrams per kilogram
PQLG – Project Quantitation Limit Goal
NC – No Criteria

1 The PSL references for surface and subsurface soil are: RBSSL - USEPA Regions 3, 6, and 9 Risk-Based Soil Screening Level, Migration to Groundwater, Dilution Attenuation Factor (DAF) = 20 (November, 2010); R-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Residential Direct Contact, adjusted to 1/10 of value for noncarcinogens (November, 2010); R-DCL – IDEM Residential Default Closure Level (May, 2009); Eco-SSL – USEPA Ecological Soil Screening Levels (2005-2008); R5 ESL-S – USEPA Region 5 (Reg 5) Ecological Screening Level, Soil (August, 2003). Refer to Appendix E for further explanation and justification of PSLs.

The Project Team will accept the laboratory analytical results for these parameters when the PSL is greater than the laboratory's LOQ, except for the chemicals listed in Table 15.2: SIM PAHs, PCP, and PCP-related compounds. If only non-detected results are reported for any of these compounds, the laboratory will re-analyze the sample using the selected ion monitoring (SIM) mode to achieve lower detection limits (shown below) for the affected compounds.

Bolded rows indicate that the PSL is between the laboratory LOQ and LOD. Except for chemicals listed in Table 15.2, the Project Team has agreed to accept these data for decision making if results that are less than the LOQ are also "J" qualified and the effect on decision making is discussed in the uncertainties section of the Risk Assessment.

Bolded and Shaded rows indicate the PSL is less than the LOD. Except for chemicals listed in Table 15.2, The Project Team has agreed to report non-detected results at the LOD and any limitations on data use that result from having detection limits that are greater than PSLs will be described in the RFI Report.
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Table 15.2
Matrix: Soil
Analytical Group: SIM PAHs, PCP, and PCP-related compounds

Analyte	CAS Number	Minimum HH PSL (mg/kg)	Minimum Eco PSL (mg/kg)	HH PSL[1] Reference	Eco PSL[1] Reference	Project Quantitation Limit Goal (PQLG) (mg/kg)	RTI LOQ (mg/kg)	RTI LOD (mg/kg)	RTI DL (mg/kg)
Pentachlorophenol	**87-86-5**	**0.028**	**2.1**	**IDEM-RDCL**	**Eco SSL**	**0.0093**	**0.033**	**0.017**	**0.0038**
1,2,4-Trichlorobenzene	120-82-1	0.136	11.1	RBSSL	Reg 5	0.045	0.033	.0.017	0.0015
1,4-Dichlorobenzene	**106-46-7**	**0.0082**	**0.546**	**RBSSL**	**Reg 5**	**0.0027**	**0.033**	**0.0067**	**0.0015**
2,4,6-Trichlorophenol	88-06-2	0.07	9.94	IDEM-RDCL	Reg 5	0.023	0.033	0.0067	0.00098
Hexachlorobenzene	**118-74-1**	**0.0106**	**0.199**	**RBSSL**	**Reg 5**	**0.0035**	**0.16**	**0.017**	**0.0011**
Benzo(a)pyrene	50-32-8	0.015	1.1	RBRSL	Eco SSL	0.005	0.0067	0.0067	0.0033
Dibenzo(a,h)anthracene	53-70-3	0.015	1.1	RBRSL	Eco SSL	0.005	0.0067	0.0033	0.0033
Naphthalene	91-20-3	0.0094	29	RBSSL	Eco SSL	0.0031	0.0067	0.0067	0.0033

Notes:

CAS – Chemical Abstracts Service
mg/kg – milligrams per kilogram
PQLG – Project Quantitation Limit Goal
NC – No Criteria

1 The PSL references for surface and subsurface soil are: RBSSL - USEPA Regions 3, 6, and 9 Risk-Based Soil Screening Level, Migration to Groundwater, DAF = 20 (November, 2010); R-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Residential Direct Contact, adjusted to 1/10 of value for noncarcinogens (November, 2010); R-DCL – IDEM Residential Default Closure Level (May, 2009); Eco-SSL – USEPA Ecological Soil Screening Levels (2005-2008); R5 ESL-S – USEPA Region 5 (Reg 5) Ecological Screening Level, Soil (August, 2003). Refer to Appendix E for further explanation and justification of PSLs.

The Project Team will accept the laboratory analytical results for these parameters when the PSL is greater than the laboratory's LOQ. Also, in cases where the PSL is between the laboratory's LOD and LOQ, the Project Team will accept these analytical results when the results are "J" qualified, that is, when they are qualified as estimated values. When the PSL is less than the LOD for a particular analyte, an evaluation of DLs and the impact on data usability will be discussed in the RFI Report. Any limitations on the data will be documented at that time and, if significant data gaps remain, additional data may be required during additional investigation phases or in support of future reports (e.g., Corrective Measure Study [CMS]).

Bolded rows indicate that the PSL is between the laboratory LOQ and LOD. The Project Team has agreed to accept these data for decision making if results that are less than the LOQ are also "J" qualified and the results are discussed in the uncertainties section of the Risk Assessment.

Bolded and Shaded rows indicate the PSL is less than the LOD; therefore, the Project Team has agreed to report non-detected results at the LOD and any limitations on data use that result from having detection limits that are greater than PSLs will be described in the RFI Report.

Table 15.3
Matrix: Soil
Analytical Group: DRO

Analyte	CAS Number	PSL (mg/kg)		PSL Reference[1]		PQLG (mg/kg)	RTI		
		HHRA	ERA	HHRA	ERA		LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
DRO (C8-C28) Diesel Range	NA	230	NC	R-DCL	None	77	1.7	1.3	1.0

1 Surface and subsurface soil screening references: R-DCL – IDEM Residential Default Closure Level (June, 2010).

Bolded rows indicate that the PSL is between the laboratory LOQ and LOD. The Project Team has agreed to accept these data for decision making if results that are less than the LOQ are also “J” qualified and the results are discussed in the uncertainties section of the Risk Assessment.

Bolded and Shaded rows indicate the PSL is less than the LOD. The Project Team has agreed to report non-detected results at the LOD and any limitations on data use that result from having detection limits that are greater than PSLs will be described in the RFI Report.

Table 15.4
Matrix: Soil
Analytical Group: Dioxins/Furans

Analyte	CAS Number	Minimum HH PSL (mg/kg)	Minimum Eco PSL (mg/kg)	HH PSL[1] Reference	Eco PSL[1] Reference	Project Quantitation Limit Goal (PQLG) (mg/kg)	CFA LOQ (mg/kg)	CFA LOD (mg/kg)	CFA EDL (mg/kg)
1,2,3,4,6,7,8,9-OCDD	**3268-87-9**	1.53E-02	**1.99E-07**	R-RSL	**R5 ESL-S**	**6.60E-08**	**1.00E-05**	**7.00E-06**	**1.00E-06**
1,2,3,4,6,7,8,9-OCDF	39001-02-0	1.53E-02	**3.86E-05**	R-RSL	**R5 ESL-S**	**1.30E-05**	1.00E-05	7.00E-06	1.00E-06
1,2,3,4,6,7,8-HpCDD	**35822-46-9**	4.60E-04	**1.99E-07**	R-RSL	**R5 ESL-S**	**6.60E-08**	**5.00E-06**	**3.00E-06**	**5.00E-07**
1,2,3,4,6,7,8-HpCDF	67562-39-4	4.60E-04	3.86E-05	R-RSL	R5 ESL-S	1.30E-05	5.00E-06	3.00E-06	5.00E-07
1,2,3,4,7,8,9-HpCDF	55673-89-7	4.60E-04	3.86E-05	R-RSL	R5 ESL-S	1.30E-05	5.00E-06	3.00E-06	5.00E-07
1,2,3,4,7,8-HxCDD	**39227-28-6**	4.60E-05	**1.99E-07**	R-RSL	**R5 ESL-S**	**6.60E-08**	**5.00E-06**	**3.00E-06**	**5.00E-07**
1,2,3,4,7,8-HxCDF	70648-26-9	4.60E-05	3.86E-05	R-RSL	R5 ESL-S	1.30E-05	5.00E-06	3.00E-06	5.00E-07
1,2,3,6,7,8-HxCDD	**57653-85-7**	4.60E-05	**1.99E-07**	R-RSL	**R5 ESL-S**	**6.60E-08**	**5.00E-06**	**3.00E-06**	**5.00E-07**
1,2,3,6,7,8-HxCDF	57117-44-9	4.60E-05	3.86E-05	R-RSL	R5 ESL-S	1.30E-05	5.00E-06	3.00E-06	5.00E-07
1,2,3,7,8,9-HxCDD	**19408-74-3**	4.60E-05	**1.99E-07**	R-RSL	**R5 ESL-S**	**6.60E-08**	**5.00E-06**	**3.00E-06**	**5.00E-07**
1,2,3,7,8,9-HxCDF	72918-21-9	4.60E-05	3.86E-05	R-RSL	R5 ESL-S	1.30E-05	5.00E-06	3.00E-06	5.00E-07
1,2,3,7,8-PeCDD	**40321-76-4**	4.60E-06	**1.99E-07**	R-RSL	**R5 ESL-S**	**6.60E-08**	**5.00E-06**	**3.00E-06**	**5.00E-07**
1,2,3,7,8-PeCDF	57117-41-6	1.53E-04	3.86E-05	R-RSL	R5 ESL-S	1.30E-05	5.00E-06	3.00E-06	5.00E-07
2,3,4,6,7,8-HxCDF	60851-34-5	4.60E-05	3.86E-05	R-RSL	R5 ESL-S	1.30E-05	5.00E-06	3.00E-06	5.00E-07
2,3,4,7,8-PeCDF	57117-31-4	1.53E-05	3.86E-05	R-RSL	R5 ESL-S	5.00E-06	5.00E-06	3.00E-06	5.00E-07
2,3,7,8-TCDD	**1746-01-6**	4.60E-06	**1.99E-07**	R-RSL	**R5 ESL-S**	**6.60E-08**	**1.00E-06**	**7.00E-07**	**1.00E-07**
2,3,7,8-TCDF	51207-31-9	4.50E-05	3.86E-05	R-RSL	R5 ESL-S	1.30E-05	1.00E-06	7.00E-07	1.00E-07

Notes:
CAS – Chemical Abstracts Service
mg/kg – milligrams per kilogram
PQLG – Project Quantitation Limit Goal
NC – No Criteria
EDL – Estimated Detection Limit. Detection limits for dioxins and furans are reported as the Average EDL in accordance with the method.

Congeners that do not have individual PSLs are included to obtain total OCDD/OCDF values and to calculate Toxicity Equivalency Factors (TEFs).

1 The PSL references for surface and subsurface soil are: RBSSL - USEPA Regions 3, 6, and 9 Risk-Based Soil Screening Level, Migration to Groundwater, DAF = 20 (November, 2010); R-RSL - USEPA Regions 3, 6, and 9 Regional Screening Level for Soil, Residential Direct Contact, adjusted to 1/10 of value for noncarcinogens (November, 2010); R-DCL – IDEM Residential Default Closure Level (May, 2009); Eco-SSL – USEPA Ecological Soil Screening Levels (2005-2008); R5 ESL-S – USEPA Region 5 (R5) Ecological Screening Level, Soil (August, 2003). Refer to Appendix E for further explanation and justification of PSLs.

The Project Team will accept the laboratory analytical results for these parameters when the PSL is greater than the laboratory's LOQ. Also, in cases where the PSL is between the laboratory's LOD and LOQ, the Project Team will accept these analytical results when the results are "J" qualified, that is, when they are qualified as estimated values. When the PSL is less than the LOD for a particular analyte, an evaluation of DLs and the impact on data usability will be discussed in the RFI Report. Any limitations on the data will be documented at that time and, if significant data gaps remain, additional data may be required during additional investigation phases or in support of future reports, (e.g., Corrective Measure Study [CMS]).

Bolded rows indicate that the PSL is between the laboratory LOQ and LOD. The Project Team has agreed to accept these data for decision making if results that are less than the LOQ are also "J" qualified and the results are discussed in the uncertainties section of the Risk Assessment.

Bolded and Shaded rows indicate the PSL is less than the LOD. The Project Team has agreed to report non-detected results at the LOD and any limitations on data use that result from having detection limits that are greater than PSLs will be described in the RFI Report.

SAP Worksheet #16 -- Project Schedule / Timeline Table (optional format)

(UFP-QAPP Manual Section 2.8.2)

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
DQO Meeting/Site Visit	Tetra Tech, Navy, IDEM	12/16/2010	12/16/2010	Meeting Minutes	12/16/2011
Draft UFP SAP	Tetra Tech	9/30/2010	3/17/2011	Draft UFP SAP	3/17/2011
Final UFP SAP	Tetra Tech	5/6/2011	6/11/2011	Final UFP SAP	6/11/2011
Draft HASP	Tetra Tech	3/17/2010	4/4/2011	Draft HASP	4/4/2011
Final HASP	Tetra Tech	4/21/2011	6/6/2011	Final HASP	6/6/2011
Field Work – Soil and Groundwater Sampling	Tetra Tech	6/20/2011	9/30/2011	NA	9/30/2011
Draft RFI Report	Tetra Tech	12/30/2011	2/20/2012	Draft RFI Report	2/20/2012
Final RFI Report	Tetra Tech	8/16/2012	6/28/2012	Final RFI Report	6/28/2012

SAP Worksheet #17 -- Sampling Design and Rationale

(UFP-QAPP Manual Section 3.1.1)

This section describes sampling design and rationale for the planned soil sampling activities to be conducted in support of the site investigation at SWMU 29 former PCP Dip Tank located at NSA Crane, Indiana.

The sampling design is based on soil locations selected to identify the presence of site-related SVOCs, DRO, and dioxins/furans potentially associated with the Dip Tank treatment solution (see Worksheet #15). Historical information which included aerial photographs and dip tank operation design drawings, were used to select locations that are most likely contaminated if releases occurred. Because the available historical information is limited, assumptions regarding potential chemical formulation of the treatment solution and operating practices have been made as described in Worksheets #10 and 11.

The laboratory will analyze the soil samples for the target analytes presented in Worksheet #15, but the analyses will be staged as described below and on Figure 11-1.

Sample Locations:	See Figure 17-1.
Matrix and number of samples:	DPT - Soil. A total of 33 soil samples will be collected from eleven boreholes.
Chemical Analyte Groups:	Site-related SVOCs, DRO, and dioxins/furans.
Analytical Method/SOPs:	See Worksheet #23.
Number of QC Samples:	See Worksheet #20.
Sample Dates:	See Worksheet #16.

All samples will be automatically analyzed for all target analytes – except dioxins and furans – to a depth of 6 ft bgs. This depth limitation was imposed because contaminant releases occurred at ground surface and even reworking of site surface soil after removal of the former dip tank, would not have caused contaminated soil to extend below about 2 feet bgs. Further vertical migration may have occurred after contaminant release, however, the bulk of contamination is expected to be limited to the surface and shallow subsurface soils.

Analyses for SVOCs will initially be accomplished using the usual Method 8270D. If PCP or any other site-related SVOC results are less than the LOQ and the LOQ exceeds the PSL, the affected samples will be re-analyzed using the more sensitive Method 8270D SIM. This will ensure that contaminants can be quantified to levels below the PSL to the extent that the SIM technique allows for this. This analysis strategy will be used for all initial and subsequent samples (described below).

There are two general groups of analyses. One group is all target analyses listed in Worksheet #15 *except* dioxins/furans (i.e., Site-related SVOCS and DRO). The other group is the dioxins/furans. Within the non-dioxins/furans group is PCP, which is being used as an indicator of potential dioxins/furans contamination.

Holding times for all target analytes but the dioxins/furans are relatively short, so samples scheduled for non-dioxins/furans analyses must be prepared for analysis within 14 days of laboratory receipt. All samples to a depth of 6 feet bgs will be automatically analyzed for the non-dioxins/furans analytical groups. These results will be used to indicate if, and at what locations, the non-dioxins/furans analyses must be extended into deeper soil intervals to complete the delineation of non-dioxins/furans contaminants. The intent is also to use the initial PCP analyses to select samples (i.e., the five samples with the greatest PCP and/or PCP degradation product concentration) for dioxins/furans analyses. This sequence of decision is presented on Figure 11-1.

If any dioxin or furan concentrations exceed their PSLs in the 2 to 6-ft interval, the 6 to 10-ft interval in the same soil boring will be analyzed for dioxins/furans to fully delineate vertical contamination. A similar strategy must be applied in the lateral direction to delineate dioxins/furans contamination greater than PSL. In no case, however, will this phase of sampling require collection of samples at more than the nine locations already identified for sampling (see Figure 17-1).

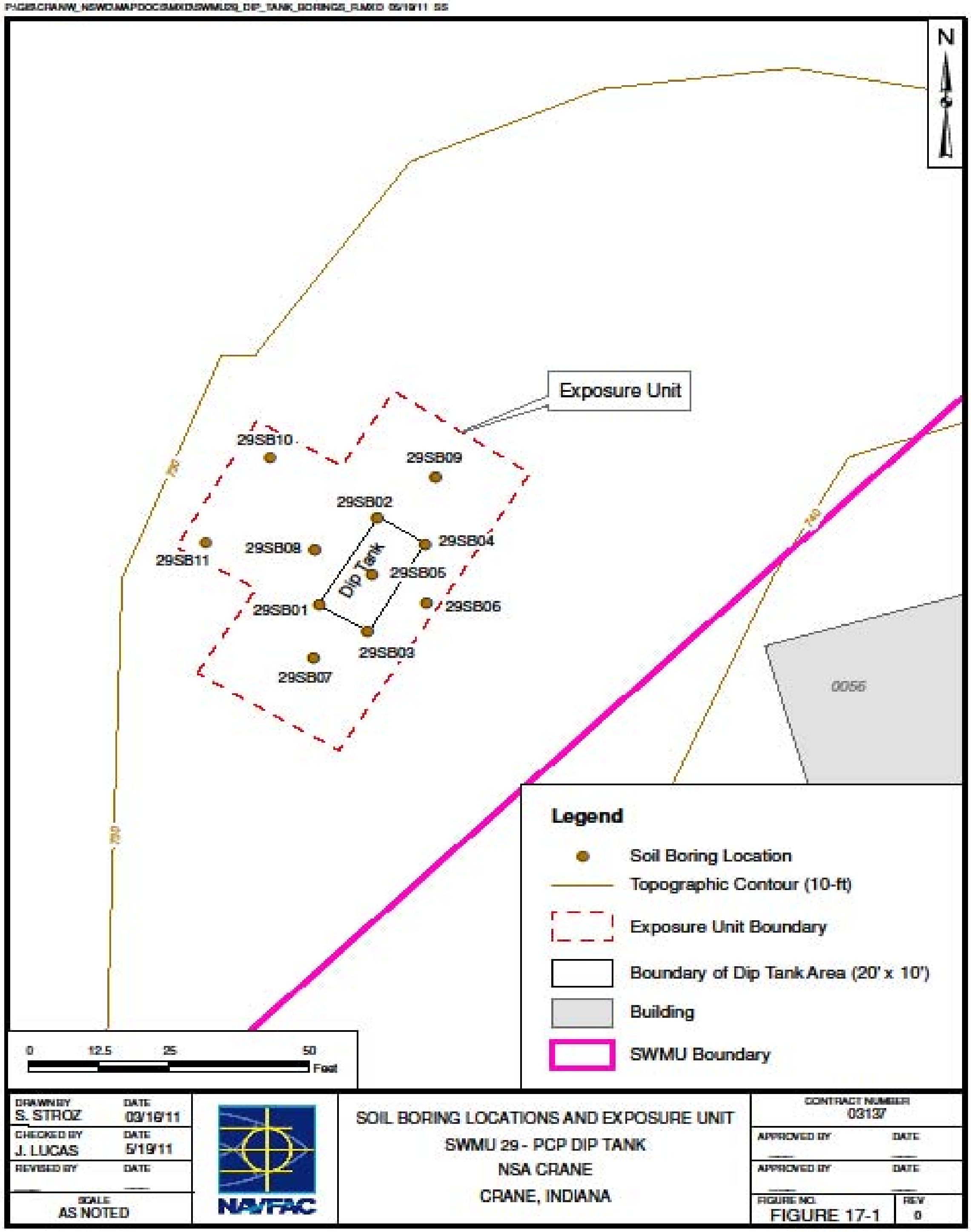
To ensure that dioxins/furans contamination is not accidentally overlooked, the five samples from the initial analyses that are most contaminated with PCP (which is more rapidly degraded than dioxins/furans) will automatically be analyzed for dioxins/furans. If none of these samples has a PCP concentration greater than the PCP PSL, dioxins/furans analyses are not required. The basis for this is that dioxins and furans are minor impurities of PCP. Furthermore, the study area is small compared to a normal residential exposure unit and soil outside the study area is expected to be less contaminated than soil within the study area. If PCP is not detectable at concentrations greater than conservative PSLs, the risk from site-related dioxins/furans contamination is insignificant because an insignificant amount of PCP was released. For example, if a particular dioxin or furan concentration in technical grade PCP is 1,000 parts per million and PCP is present in the soil at the PSL concentration, the dioxins/furans concentration would be 0.028 mg/kg * 1,000/1,000,000 = 2.8 E-5 mg/kg, and would be less than most of the human health and ecological PSLs listed in Worksheet #15.

Soil Sampling Strategy

The 11 sample locations are shown on Figure 17-1. Sample borings will be installed at the following locations:

- One at each corner of the former PCP pit (for a total of four samples locations)
- One under the center of the former PCP pit
- Four locations representing the perimeter area around the tank location.
- Two down the northwestern slope.

The selected boring locations target the portion of SWMU 29 that included the location of the former Dip Tank and soil area that may have been impact by a leaking tank or tank operations. Details regarding soil sampling equipment and procedures are included in Worksheet #14 and the field SOPs which are contained in Appendix D. If the data collected during this first round of analyses is insufficient to support a risk assessment (including delineation of contamination), additional data collection will be recommended. The flow chart on Figure 11-1 does not specify data collection requirements for subsequent phases of investigation because the design of subsequent phases depends on the results from earlier rounds of sampling. Nevertheless, the decision logic for multiple rounds of sampling, to include risk assessment, has been detailed on Figure 11-1 as completely as possible. This facilitates making small changes or additions to this SAP for subsequent data collection, if necessary. Changes to the sampling design should be documented in an FTMR or a SAP Addendum.


N
Exposure Unit
29SB10
29SB09
29SB02
29SB04
29SB08
29SB11
Dip Tank
29SB05
29SB01
29SB06
29SB03
29SB07
740
0056
Legend
Soil Boring Location
Topographic Contour (10-ft)
Exposure Unit Boundary
Boundary of Dip Tank Area (20' x 10')
Building
SWMU Boundary
0
12.5
25
50
Feet
DRAWN BY
S. STROZ
DATE
03/16/11
CHECKED BY
J. LUCAS
DATE
5/19/11
REVISED BY
DATE
SCALE
AS NOTED
NAVFAC
SOIL BORING LOCATIONS AND EXPOSURE UNIT
SWMU 29 - PCP DIP TANK
NSA CRANE
CRANE, INDIANA
CONTRACT NUMBER
03137
APPROVED BY
DATE
APPROVED BY
DATE
FIGURE NO.
FIGURE 17-1
REV
0

SAP Worksheet #18 -- Sampling Locations and Methods/SOP Requirements Table

(UFP-QAPP Manual Section 3.1.1)

Sampling Location	ID Number	Matrix	Depth (feet bgs)	Analytical Group (1)	Number of Samples (1)	Sampling SOP Reference(2)
SWMU 29 Soil Location 01	29SB010002 and 29SBFDXXXXXX-01(2)	Soil	0 - 2	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1 + 1 FD	SOP-05, SOP-07, SOP-08
	29SB010206	Soil	2 - 6	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1 + 1 FD TBD	
	29SB010610	Soil	6 - 10	See Figure 11-1.	1	
SWMU 29 Soil Location 02	29SB020002	Soil	0 - 2	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	SOP-05, SOP-07, SOP-08
	29SB020206	Soil	2 - 6	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	
	29SB020610	Soil	6 - 10	See Figure 11-1.	1	

Sampling Location	ID Number	Matrix	Depth (feet bgs)	Analytical Group (1)	Number of Samples (1)	Sampling SOP Reference(2)
SWMU 29 Soil Location 03	29SB030002	Soil	0 - 2	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	SOP-05, SOP-07, SOP-08
	29SB030206	Soil	2 - 6	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	
	29SB030610	Soil	6 - 10	See Figure 11-1.	1	
SWMU 29 Soil Location 04	29SB040002	Soil	0 - 2	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1	1	SOP-05, SOP-07, SOP-08
	29SB040206	Soil	2 - 6	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	
	29SB040610	Soil	6 - 10	See Figure 11-1.	1	
SWMU 29 Soil Location 05	29SB050002	Soil	0 - 2	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	SOP-05, SOP-07, SOP-08

Sampling Location	ID Number	Matrix	Depth (feet bgs)	Analytical Group [1]	Number of Samples [1]	Sampling SOP Reference[2]
	29SB050206	Soil	2 - 6	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	
	29SB050610	Soil	6 - 10	See Figure 11-1.	1	
SWMU 29 Soil Location 06	29SB060002	Soil	0 - 2	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	SOP-05, SOP-07, SOP-08
	29SB060206	Soil	2 - 6	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	
	29SB060610	Soil	6 - 10	See Figure 11-1.	1	
SWMU 29 Soil Location 07	29SB070002	Soil	0 - 2	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	SOP-05, SOP-07, SOP-08
	29SB070206	Soil	2 - 6	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	
	29SB070610	Soil	6 - 10	See Figure 11-1.	1	

Sampling Location	ID Number	Matrix	Depth (feet bgs)	Analytical Group [(1)]	Number of Samples [(1)]	Sampling SOP Reference[(2)]
SWMU 29 Soil Location 08	29SB080002	Soil	0 - 2	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	SOP-05, SOP-07, SOP-08
	29SB080206	Soil	2 - 6	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	
	29SB080610	Soil	6 - 10	See Figure 11-1.	1	
SWMU 29 Soil Location 09	29SB090002	Soil	0 - 2	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	SOP-05, SOP-07, SOP-08
	29SB090206	Soil	2 - 6	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	
	29SB090610	Soil	6 - 10	See Figure 11-1.	1	
SWMU 29 Soil Location 10	29SB100002	Soil	0 - 2	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	SOP-05, SOP-07, SOP-08

Sampling Location	ID Number	Matrix	Depth (feet bgs)	Analytical Group (1)	Number of Samples (1)	Sampling SOP Reference(2)
	29SB100206	Soil	2 - 6	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	
	29SB100610	Soil	6 - 10	See Figure 11-1.	1	
SWMU 29 Soil Location 11	29SB110002	Soil	0 - 2	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	SOP-05, SOP-07, SOP-08
	29SB110206	Soil	2 - 6	Site-related SVOCs, SIM PAHs, PCP, PCP related compounds, DRO. Dioxins/furans contingent upon initial PCP analyses. See Figure 11-1.	1	
	29SB110610	Soil	6 - 10	See Figure 11-1.	1	

1. The number of samples analyzed for a particular analytical group and whether or not an analysis group is analyzed on a particular sample depends on results of analyses for the 0 to 2 ft and 2 to 6 ft intervals. All 0 to 2 ft and 2 to 6 ft samples will be analyzed for PCP, site-related SVOCs, and DRO as indicated in Tables 15.1 and 15.3.. If detection and quantitation limits are not low enough, these samples will also be analyzed by SIM as indicated in Table 15.2. Follow Figure 11-1 to determine additional analysis requirements.
2. SOP or worksheet that describes the sample collection procedures (Worksheet #21). SOPs are in Appendix D.
3. Field duplicate locations may change in the field based on visual (soil staining) and/or olfactory observations.“XXXXXX” represents date collected.

TBD - To be determined.

SAP Worksheet #19 -- Analytical SOP Requirements Table

(UFP-QAPP Manual Section 3.1.1)

Matrix	Analytical Group	Analytical and Preparation Method/SOP Reference[1]	Containers (number, size, and type)	Sample Volume (units)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Soil	Site-related SVOCs	SW-846 3550B/8270D RTI SOP-3550B_031010_R6.1, 8270D_092310_R11	One 4-ounce (oz) amber glass jar	100 gram (g)	Light protected, Cool to < 6 °C	14 days until extraction, 40 days to analysis
Aqueous QC samples	Site-related SVOC s	SW-846 3510C/8270D RTI SOP-3510C_110909_R7, 8270D_092310_R11	Two 1 - liter (L) glass amber bottles	1,000 milliliter (mL)	Light protected, Cool to < 6 °C	7 days until extraction, 40 days to analysis
Soil	SIM PAHs, PCP, and PCP related compounds	SW-846 3550B/8270D SIM RTI SOP-3550B_031010_R6.1, 8270D_092310_R11	One 4-oz amber glass jar	100 g	Light protected, Cool to < 6 °C	14 days until extraction, 40 days to analysis
Soil	Dioxins/Furans	SW-846 8290A/ Cape Fear SOP- CF-OA-E-01 and 02	Two 4-oz amber glass jars	100g	Cool to ≤ 6 °C	3 months from collection to extraction, 45 days from extraction to analysis [2]
Aqueous QC samples	Dioxins/Furans	SW-846 8290A/ Cape Fear SOP- CF-OA-E-01 and 02	Two 1 L glass - amber	1,000 mL	Cool to ≤ 6 °C	3 months from collection to extraction, 45 days from extraction to analysis [2]
Soil	DRO	SW-846 3550B/8015B, RTI SOP-8015BDRO_ORO_100110_R1_1	One 4-oz glass jar with a Teflon-lined lid	25 g	Cool to ≤6 °C	14 days until extraction, 28 days to analysis

1 This holding time was extended from the normal 30 days to extraction, as allowed by Method 8290A.

SAP Worksheet #20 -- Field Quality Control Sample Summary Table

(UFP-QAPP Manual Section 3.1.1)

Matrix	Analytical Group	No. of Sampling Locations[2]	No. of Field Duplicates	No. of MS/MSDs[1]	No. of Field Blanks	No. of Equip. Blanks	Total No. of Samples to Lab[3]
Surface Soil	Site related-SVOCs	11	1	1/1	0	0	12
Subsurface Soil	Site related-SVOCs	11	1	1/1	0	0	12 minimum; 24 maximum
Surface Soil	DRO	11	1	1/1	0	0	12
Subsurface Soil	DRO	11	1	1/1	0	0	12 minimum; 24 maximum
Surface Soil	Dioxins/Furans	11[4]	1	1/1	0	0	0 minimum; 6 maximum
Subsurface Soil	Dioxins/Furans	11[4]	1	1/1	0	0	0 minimum; 6 maximum
Surface Soil	SIM PAHs, PCP, and PCP related compounds	11	1	1/1	0	0	0 minimum; 12 maximum
Subsurface Soil	SIM PAHs, PCP, and PCP related compounds	11	1	1/1	0	0	0 minimum; 24 maximum

1 Although the MS/MSD is not typically considered a field QC it is included here because location determination is often established. The MS/MSD is not included in the Total No. of Samples sent to the Lab.
2 The number of sampling locations is nine. Each soil boring will be divided into the following three depth intervals: 0-2 foot, 2-6 foot, 6-10 foot bgs.
3 The number of samples sent to the laboratory is 11 x 3 = 33. However, the total number of analyses and type of analysis conducted on a sample depends on a sequence of evaluations involving initial and subsequent analyses. These evaluations are described in Worksheet #17 and depicted on Figure 11-1.
4 As described in Worksheet #17, only the five samples exhibiting the highest PCP and/or PCP degradation product concentrations will be analyzed for dioxins/furans.

SAP Worksheet #21 -- Project Sampling SOP References Table

(UFP-QAPP Manual Section 3.1.2)

Reference Number	Title, Revision Date and / or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
SOP-01	Sample Labeling, May 2011	Tetra Tech	NA	Y	Contained in Appendix D
SOP-02	Sample Identification Nomenclature, May 2011	Tetra Tech	NA	Y	Contained in Appendix D
SOP-03	Sample Custody and Documentation of Field Activities, May 2011	Tetra Tech	NA	Y	Contained in Appendix D
SOP-04	Decontamination of Field Sampling Equipment, May 2011	Tetra Tech	Decontamination equipment, scrub brushes, 5-gallon buckets, spray bottles, phosphate free detergent, deionized water	Y	Contained in Appendix D
SOP-05	Borehole Advancement and Soil Coring for Soil Sampling Using Direct-Push Technology, May 2011	Tetra Tech	DPT Rig	Y	Contained in Appendix D
SOP-06	Management of Investigation-Derived Waste, May 2011	Tetra Tech	NA	Y	Contained in Appendix D
SOP-07	Borehole and Soil Sample Logging, May 2011	Tetra Tech	Field logbook, sample log sheets, boring logs	Y	Contained in Appendix D
SOP-08	Sample Preservation, Packaging, and Shipping, May 2011	Tetra Tech	NA	Y	Contained in Appendix D
SOP-09	Global Positioning, May 2011	Tetra Tech	GPS unit	Y	Contained in Appendix D

SAP Worksheet #22 -- Field Equipment Calibration, Maintenance, Testing, and Inspection Table

(UFP-QAPP Manual Section 3.1.2.4)

Field Equipment	Activity[1]	Frequency	Acceptance Criteria	Corrective Action	Resp. Person	SOP Reference	Comments
GPS	Positioning	Beginning and end of each day used	Accuracy: sub-meter horizontal dilution of precision (HDOP) <3, number of satellites at least six.	Wait for better signal, replace unit, or choose alternate location technique	Tetra Tech FOL or designee	SOP-09	SOP located in Appendix D

1 Activities may include: calibration, verification, testing, and maintenance.

SAP Worksheet #23 -- Analytical SOP References Table

(UFP-QAPP Manual Section 3.2.1)

Lab SOP Number	Title, Revision Date, and/or Number	Definitive or Screening data	Matrix and Analytical Group	instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
8270D_092310_R11	Analysis of Semi-volatile Organic Compounds, Revision 11, 09/23/10	Definitive	Soil and aqueous QC samples/ SVOCs, PAHs, PCP	Gas Chromatography/ Mass Spectrometry (GC/MS)	RTI	N
3550B_031010_R6.1	Sonication Extraction Procedure for Semi-volatile Organics, Revision 6.1, 03/10/10	Definitive	Aqueous QC samples/ SVOC and DRO extraction	NA/ Extraction	RTI	N
3510C_110909_R7	Liquid-Liquid Extraction Procedure for Semi-volatile Organic Compounds, Revision 7, 11/09/09	Definitive	Soil samples/ SVOC, PAH, PCP extraction	Separatory Funnel/ Extraction	RTI	N
CF-OA-E-001	Dioxin, Furan, PCB Congener Sample Processing - Revision 3, 08/04/10	Definitive	Soil and Aqueous QC samples/ Dioxins	Continuous Liquid to Liquid Extraction (CLLE)/ Soxhelet	CFA	N

Lab SOP Number	Title, Revision Date, and/or Number	Definitive or Screening data	Matrix and Analytical Group	instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
CF-OA-E-002	The Analysis of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans (PCDDS/PCDFS) by High-Resolution Gas Chromatography/High Resolution Mass Spectrometry (HRGC/HRMS) Revision 7, July 2010	Definitive	Soil and Aqueous QC samples/ Dioxins	HRGC/HRMS	CFA	N
RTI SOP-8015BDRO_ORO_100110_R1_1	Analysis Of Diesel And Oil (Residual/Lube) Range Organic Compounds, Revision 1.1, 10/01/10	Definitive	Soil / TPH DRO	GC/FID	RTI	N

Copies of laboratory SOPs listed are included in Appendix B.

SAP Worksheet #24 -- Analytical Instrument Calibration Table

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS Site-related SVOCs and SIM PAHs, PCP, and PCP related compounds	Breakdown Check (DDT only)	At the beginning of each 12-hour analytical sequence.	The degradation must be ≤ 20% for DDT to verify inertness of the injection port.	Correct the problem then repeat breakdown check. No samples shall be run until degradation is ≤20% for DDT.	Analyst/ Supervisor	RTI SOP 8270D_09 2310_R11
	Tune Verification – decafluoro-triphenyl-phosphine (DFTPP).	Prior to each ICAL and at the beginning of each 12-hour analytical sequence.	Must meet the ion abundance criteria required by the method (SW-846 8270D; Table 3), DDT degradation < 20%.	Retune and/or clean or replace source. No samples may be accepted without a valid tune.	Analyst/ Supervisor	
	Initial Calibration (ICAL) – a minimum of a five-point calibration is prepared for all target analytes.	Upon instrument receipt, for major instrument changes, or when continuing calibration verification (CCV) does not meet criteria.	All ICAL compounds must pass using one of three types of criteria: The percent relative standard deviation (RSD) for average response factor (RF) must be less than 20%, a linear regression model where the linear regression correlation coefficient (r) is >0.99, or a non-linear (quadratic) regression, which must include 6 data points (minimum of 3 statistical degrees of freedom) and have a coefficient of determination (r^2) >0.99. The minimum average RF for the System Performance Check Compound (SPCC) compounds are set by the method (see section 8.7.3). For compounds that exceed 20% RSD the linear regression function of the data system will be used for analyte quantification, provided r > 0.99.	Correct problem then repeat ICAL. Samples cannot be analyzed until ICAL has passed.	Analyst/ Supervisor	

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
	Retention Time (RT) Window Position Establishment	Once per ICAL for each analyte and surrogate.	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used.	None	Analyst/ Supervisor	
	Evaluation of Relative Retention Times (RRTs)	With each sample.	RRT of each target analyte must be within ± 0.06 RRT units.	Correct problem, then rerun ICAL.	Analyst/ Supervisor	
	Initial Calibration Verification (ICV) – Second Source	Once after each ICAL, prior to beginning a sample run.	The percent recovery (%R) for all target analytes must be within 75-125%.	Correct problem and verify ICV. If that fails, correct problem and repeat ICAL. Samples cannot be analyzed until the ICV has been verified.	Analyst/ Supervisor	
	CCV	Perform one per 12-hour analysis period after tune and before sample analysis.	The minimum RF for SPCCs must be as per SOP Section 8.7.3.1. The percent difference or percent drift (%D) for all target analytes and surrogates must be ≤ 20%.	Correct problem and rerun CCV. If that fails, repeat ICAL and reanalyze all samples analyzed since the last successful CCV.	Analyst/ Supervisor	

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
HRGC/HRMS Dioxins/ Furans	Tune / Mass Resolution Check	At the beginning and the end of each 12-hour period of analysis.	Static resolving power must be ≥ 10,000 (10% valley) for identified masses per method and lock-mass ion between lowest and highest masses for each descriptor and level of reference must be ≤ 10% full-scale deflection.	Retune instrument and verify. Assess data for impact. If end resolution is less than 10,000, narrate or re-inject, as necessary.	Analyst, Department Manager	CF-OA-E-02 Sec. 14-15
	GC Column Performance Check Solution (CPSM)	Prior to ICAL or CCV.	Peak separation between 2,3,7,8-TCDD and other TCDD isomers must result in a valley of ≤ 25% per method; <u>and</u> identification of all first and last eluters of the eight homologue retention time windows and documentation by labeling (F/L) on the chromatogram; <u>and</u> absolute retention times for switching from one homologous series to the next ≥ 10 seconds for all components of the mixture.	1) Readjust windows. 2) Evaluate system. 3) Perform maintenance. 4) Reanalyze CPSM. 5) No corrective action is necessary if 2,3,7,8-TCDD is not detected and the % valley is greater than 25%.	Analyst, Department Manager	CF-OA-E-02 Sec. 14
	ICAL – a minimum of a 5-point calibration is prepared for all target analytes	Prior to sample analysis, as needed by the failure of CCV, and when a new lot is used as a standard source.	Ion abundance ratios must be within limits specified in SOP; <u>and</u> signal to noise ratio (S/N) must be ≥ 10:1 for all target analyte ions; and RSD must be ≤ 20% for RFs for all 17 unlabelled standards and 9 labeled ISs.	Correct problem, then repeat ICAL. No samples may be run until ICAL has passed.	Analyst, Department Manager	CF-OA-E-02 Sec. 14

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
	CCV	At the beginning of each 12-hour period, and at the end of each analytical sequence.	Ion abundance ratios must be in accordance with SOP; <u>and</u> RF (unlabelled standards) must be ≤ 20%D of average RF from ICAL; <u>and</u> RF (labeled standards) must be ≤ 30%D of average RF from ICAL.	Correct problem, repeat CCV. If CCV fails, repeat ICAL and reanalyze all samples analyzed since last successful CCV <u>End of Run CCV:</u> If RF (unlabeled standards) >20%D and ≤25%D and/or RF (labeled standards) >30%D and ≤35%D of the average RF from ICAL, then use mean RF from bracketing CCVs to quantitate impacted samples instead of the ICAL mean RF value. If bracketing CCVs differ by more than 25% RPD (unlabeled) or 35% RPD (labeled), then run a new ICAL within 2 hours, and re-quantitate samples. Otherwise, reanalyze samples with positive detections.	Analyst, Department Manager	CF-OA-E-02 Sec. 15

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
	Qualitative Determination	Each peak to be considered a PCDD or PCDF	2,3,7,8-substituted isomers with labeled standards: RT within -1 to +3 seconds of labeled standard; 2,3,7,8-substituted isomers without labeled standards: RRT within 0.005 RRT units of that in CVS; Non-2,3,7,8-substituted isomers: RT within window definition; Ions alignment (± 2 sec.); Ion ratios in accordance with method criteria; S/N ratio of ISs ≥ 10 times background noise and S/N ratio of all remaining ions for unlabeled analytes ≥ 2.5 times background noise; and for PCDFs: no PCDPEs at the same retention time as PCDF signal present having a S/N ratio ≥ 2.5(± 2 sec). 2378-TCDF requires DB-225 confirmation when detected above the LOQ by the primary analysis.	Consider peak a nondetect when any failures occur. Consider re-extraction with less sample amount or additional cleanup where labeled compounds fail. Report estimated maximum positive concentration (EMPC) if required for failing ion ratio.	Analyst/ Supervisor	CF-OA-E-02 Sec. 15
GC/FID DRO	ICAL – A minimum of a 5-point calibration is prepared for all target analytes	Upon instrument receipt, major instrument change, when CCV does not meet criteria.	The %RSD for each target analyte must be ≤ 20%, or r must be ≥ 0.995; or r^2 must be ≥ 0.99 (minimum of 6 points required for second order).	Correct problem then repeat ICAL. No samples may be run until ICAL has passed.	Analyst/ Supervisor	RTI SOP-8015BDRO_ORO_100110_R1_1
	ICV – Second Source	Once after each ICAL prior to sample analysis.	The %R of all target analytes must be within 80-120% of true value.	Evaluate, repeat, if still failing, recalibrate.	Analyst/ Supervisor	
	CCV	Analyze standard at the beginning and end of sequence and after every 10 samples.	The %D of all target analytes must be ≤20%.	If %D is high and sample result is ND, qualify/narrate with project approval. If %D is low or project approval not received, reanalyze all samples since the last successful CCV.	Analyst/ Supervisor	

SAP Worksheet #25 -- Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

(UFP-QAPP Manual Section 3.2.3)

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CA	Responsible Person	SOP Reference (1)
GCMS	Check pressure and gas supply daily. Manual tune if DFTPP not in criteria, change septa as needed, change liner as needed, cut column as needed. Other maintenance specified in Equipment Maintenance section of SOP.	Site-related SVOCs and SIM PAHs, PCP, and PCP related compounds	Ion source, injector liner, column, column flow.	Prior to ICAL and/or as necessary.	Acceptable ICAL or CCV	Correct the problem and repeat ICAL or CCV. Recalibrate or stop for service on repeat failure.	Analyst, Department Manager	RTI SOP 8270D_09 2310_R11
HRGC/ HRMS	Daily items may include septa replacement, injection port items, solvent replenishment, instrument tuning adjustment, etc.	Dioxins/ Furans	Instrument resolving power, GC performance , and isomer specificity are monitored daily.	Maintenance is ongoing and performed as needed. Preventative maintenance such as septa replacement and solvent replenishment is performed daily.	Successful daily instrument calibration per requirements.	Documentation of item addressed is located in the instruments maintenance logbook. All instrument maintenance items are recorded.	Instrument Operator	CF-OA-E-002 Rev 7
GC/FID	Check pressure and gas supply daily. Change septa and/or liner as needed, replace or cut column as needed. Other maintenance specified in lab Equipment Maintenance SOP.	DRO	Injector liner, septa, column, column flow.	Prior to ICAL and as necessary.	Acceptable ICAL and CCV.	Correct the problem and repeat ICAL or CCV.	Analyst/ Supervisor	RTI SOP-8015BDRO_ORO_100110_R1_1

1 Reference SOPs are provided in Appendix C.

SAP Worksheet #26 -- Sample Handling System

(UFP-QAPP Manual Appendix A)

SAMPLE HANDLING SYSTEM
SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
SAMPLE COLLECTION (PERSONNEL/ORGANIZATION): FOL, TETRA TECH
SAMPLE PACKAGING (PERSONNEL/ORGANIZATION): FOL, TETRA TECH
COORDINATION OF SHIPMENT (PERSONNEL/ORGANIZATION): FOL, TETRA TECH
TYPE OF SHIPMENT/CARRIER: OVERNIGHT COURIER SERVICE (FEDEX)
SAMPLE RECEIPT AND ANALYSIS
SAMPLE RECEIPT (PERSONNEL/ORGANIZATION): RTI AND CFA SAMPLE CUSTODIANS
SAMPLE CUSTODY AND STORAGE (PERSONNEL/ORGANIZATION): RTI AND CFA SAMPLE CUSTODIANS
SAMPLE PREPARATION (PERSONNEL/ORGANIZATION): RTI AND CFA EXTRACTION LABORATORY ANALYSTS
SAMPLE DETERMINATIVE ANALYSIS (PERSONNEL/ORGANIZATION):GC, GC/MS, HRGC/HRMS LABORATORY ANALYSTS, RTI AND CFA
SAMPLE ARCHIVING
FIELD SAMPLE STORAGE (NO. OF DAYS FROM SAMPLE COLLECTION): 60 DAYS
SAMPLE EXTRACT/DIGESTATE STORAGE (NO. OF DAYS FROM EXTRACTION/DIGESTION): 60 DAYS
BIOLOGICAL SAMPLE STORAGE (NO. OF DAYS FROM SAMPLE COLLECTION): NOT APPLICABLE
SAMPLE DISPOSAL
PERSONNEL/ORGANIZATION: RTI AND CFA SAMPLE CUSTODIANS

SAP Worksheet #27 -- Sample Custody Requirements Table

(UFP-QAPP Manual Section 3.3.3)

Field Custody Procedures

Sample labeling and custody requirements are described in SOPs-01 through -03 and near the end of Worksheet #14.

Laboratory Custody Procedures

The analytical laboratory's sample receipt and chain-of-custody procedure are detailed in RTI's and CFA's SOPs [RTI SOP SRC001-A_R5 (Sample Receipt and Custody), CFA SOP CF-SR-E-001 (Sample Receipt, Log-in, and Storage)] in Appendix C. The laboratory sample custodian will inspect the integrity of the cooler custody seals and measure the temperature of the samples received using the "Temperature Blank" container included in each cooler. The samples will be checked against the chain-of-custody form for holding times, sample identification, and integrity. The samples will be logged into the laboratory management system. Custody of the samples will be maintained and recorded in the laboratory, from receipt to analysis, and this record will be included with the data package deliverables.

SAP Worksheet #28 -- Laboratory QC Samples Table

(UFP-QAPP Manual Section 3.4)

Matrix	Soil and Aqueous QC Blanks
Analytical Group	Site-related SVOCs and SIM PAHs, PCP, and PCP related compounds
Analytical Method/ SOP Reference	SW-846 8270D and 8270D SIM/ RTI SOP-8270D_092310_R11

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per batch of 20 or less samples.	No target compounds should be > ½ the LOQ.	Correct problem, then see criteria in Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.1, Box D-1. If required, re-prepare and reanalyze method blank and all samples processed with the contaminated blank.	Laboratory Analyst, Supervisor, Data Validator	Bias/ Contamination	Same as QC Acceptance Limits.
Laboratory Control Sample (LCS)	One per batch of 20 or less samples.	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM.	Correct problem, re-prepare and re-analyze affected samples.	Laboratory Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits.
Matrix Spike (MS)/ Matrix Spike Duplicate (MSD)	One per batch of 20 or less samples.	%Rs should meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM. The RPD between MS and MSD should be ≤ 30%.	Investigate, consult with client, and record matrix issues in case narrative.	Laboratory Analyst, Supervisor, Data Validator	Accuracy/ Bias/ Precision	Same as QC Acceptance Limits.

Matrix	Soil and Aqueous QC Blanks
Analytical Group	Site-related SVOCs and SIM PAHs, PCP, and PCP related compounds
Analytical Method/ SOP Reference	SW-846 8270D and 8270D SIM/ RTI SOP-8270D_092310_R11

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogates	All field and QC samples. Six per sample: 2-Fluorophenol Phenol-d6 Nitrobenzene-d5 2-Fluorobiphenyl 2,4,6-Tribromophenol Terphenyl-d14	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM.	Check integrations for errors, check calculations for errors, and check instrument performance. Re-extract and re-analyzed the samples if the above show no problems or flag the data if sample matrix interference is present.	Laboratory Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits.
Internal Standards (IS)	Every field sample, standard, and QC sample. Six per sample – 1,4-Dichlorobenzene-d4 Naphthalene-d8 Acenaphthene-d10 Phenanthrene-d10 Chrysene-d12 Perylene-d12	RTs must be within ± 30 seconds and the response areas must be within -50% to +100% of the ICAL midpoint standard for each IS.	Inspect MS or GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning.	Laboratory Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits.
Results between DL and LOQ	NA	Apply “J” qualifier to results detected between DL and LOQ.	NA.	Analyst, Supervisor, Data Validator	Accuracy	Same as QC Acceptance Limits.

Matrix	Soil and Aqueous QC blanks
Analytical Group	Dioxins/Furans
Analytical Method/ SOP Reference	SW-846 8290A CFA CF-OA-E-002

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	One per batch of 20 or fewer samples per matrix.	All target analytes must be ≤ LOQ.	Correct problem. If required, re-prepare and reanalyze method blank and all samples processed with the contaminated blank. "Totals" are not considered "target analytes" – no corrective action or flagging is necessary for "totals".	Analyst, Department Manager, Data Validator	Bias / Contamination	Same as QC Acceptance Limits.
Extraction standards	Every field sample, standard and QC sample.	%Rs must be between 40 and 135%.	Evaluate data quality. If needed, re-extract and reanalyze the sample.	Analyst, Department Manager, Data Validator	Accuracy	Same as QC Acceptance Limits.
Ongoing Precision Recovery (OPR)	One per preparatory batch of 20 or fewer samples of similar matrix	%Rs must be between 70 and 130%.	Perform routine instrument maintenance. Reanalyze any associated samples.	Analyst, Department Manager, Data Validator	Accuracy / Bias	Same as QC Acceptance Limits.
OPR Duplicate	One per preparatory batch of 20 or fewer samples of similar matrix	%Rs must be between 70 and 130%. The RPD should be ≤ 20%.	Perform routine instrument maintenance. Reanalyze any associated samples.	Analyst, Department Manager, Data Validator	Precision	Same as QC Acceptance Limits.
IS	Every field sample, standard, and QC sample.	The %R for each IS must be within 40-135% as per DOD QSM Version 4.1.	Correct problem, then re-prepare and reanalyze the samples with failed IS.	Analyst, Department Manager, Data Validator	Accuracy	Same as QC Acceptance Limits.

Matrix	Soil and Aqueous QC blanks
Analytical Group	Dioxins/Furans
Analytical Method/ SOP Reference	SW-846 8290A CFA CF-OA-E-002

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
LCS	One per preparatory batch of 20 or fewer samples of similar matrix	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM.	Correct problem, then re-prepare and reanalyze the LCS and all samples in the associated preparatory batch for failed target analytes, if sufficient sample material is available.	Analyst, Department Manager, Data Validator	Accuracy	Same as QC Acceptance Limits.
MS/MSD	One per preparatory batch of 20 or fewer samples of similar matrix	%Rs should meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM. The RPD between MS and MSD should be ≤ 20%.	Identify problem; if not related to matrix interference, re-extract and reanalyze MS/MSD and all associated batch samples in accordance with DoD QSM requirements.	Analyst, Department Manager, Data Validator	Accuracy / Bias Precision	Same as QC Acceptance Limits.
Results between EDL and LOQ	Each sample.	Quantitated value < lower end of linear calibration range and > EDL.	Report values and flag results. Flag associated results with ‘J’ on Form Is.	Analyst, Department Manager, Data Validator	Accuracy	Same as QC Acceptance Limits.

Matrix	Soil and Aqueous QC Samples
Analytical Group	TPH DRO
Analytical Method / SOP Reference	SW-846 Method 8015B RTI SOP-8015BDRO_ORO_100110_R1_1

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparatory batch of 20 or fewer samples.	All target analytes must be ≤ ½ LOQ.	If the method blank acceptance criteria are not met, identify and correct the source of contamination, and re-prepare and reanalyze the associated samples.	Analyst, Supervisor, Data Validator	Bias/ Contamination	Same as QC Acceptance Limits
LCS	One per preparatory batch of 20 or fewer samples of similar matrix.	%R must be within 50-150% of true value.	If LCS acceptance limits are not met, the LCS should be reanalyzed once to confirm that the original analysis is reliable. If the results are still outside control limits, the associated sample must be re-extracted and reanalyzed.	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits
MS/MSD	One per preparatory batch of 20 or fewer samples of similar matrix.	%Rs should be within 50-150% of true value (if sample is < 4x spike added). The RPD between MS and MSD should be ≤ 30%.	CA will not be taken for samples when %Rs are outside limits and surrogate and LCS criteria are met unless RPDs indicate obvious extraction/ analysis difficulties, then re-prepare and reanalyze MS/MSD.	Analyst, Supervisor, Data Validator	Accuracy/ Bias/ Precision	Same as QC Acceptance Limits

Matrix	Soil and Aqueous QC Samples
Analytical Group	TPH DRO
Analytical Method / SOP Reference	SW-846 Method 8015B RTI SOP-8015BDRO_ORO_100110_R1_1

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogate	All field and QC samples - one per sample o-Terphenyl.	The %R of the surrogate must fall within 50-150%.	If surrogate %R is outside the established limits, verify calculations, dilutions, and standard solutions. Also verify that the instrument performance is acceptable. If the surrogate %R is outside the established limits due to well-documented matrix effects, the results must be flagged and an explanation included in the report narrative.	Analyst, Supervisor, Data Validator	Accuracy	Same as QC Acceptance Limits
Results between DL and LOQ	NA.	Apply "J" qualifier to results detected between DL and LOQ.	NA.	Analyst, Supervisor, Data Validator	Accuracy	Same as QC Acceptance Limits

SAP Worksheet #29 -- Project Documents and Records Table

(UFP-QAPP Manual Section 3.5.1)

Document	Where Maintained
Sample Collection Documents and Records: • Field logbook (and sampling notes) • Field sample forms (e.g., boring logs, sample logsheets, drilling logs, etc.) • Chain-of-custody records • Sample shipment airbills • Equipment calibration logs • Photographs • Field task modification forms • Sampling and analysis plan • Field Sampling SOPs	Field documents will be maintained in the project file located in the Tetra Tech Pittsburgh office.
Laboratory Documents: • Sample receipt, custody, and tracking record • Equipment calibration logs • Sample preparation logs • Analysis Run logs • CA forms • Reported field sample results • Reported results for standards, QC checks, and QC samples • Extraction/clean-up records • Raw data	Laboratory documents will be included on a CD and in portable documents format deliverables from the laboratory. Laboratory data deliverables will be maintained in the Tetra Tech Pittsburgh project file and in long-term data package storage at a third-party professional document storage firm. Electronic data results will be maintained in a database on a password protected SQL server.
Data Assessment Documents and Records: • Field Sampling Audit Checklist (if an audit is conducted) • Analytical Audit Checklist (if an audit is conducted) • Data Validation Memoranda • All Versions of Project Reports	All assessment documents will be maintained in the Tetra Tech Pittsburgh office.
Data Handling and Management • Data Tracking and Control • Data Tracking. • Data Storage, Archiving, and Retrieval. • Data Security.	All data handling and management activities will be conducted in the Tetra Tech Pittsburgh office.

SAP Worksheet #30 -- Analytical Services Table

(UFP-QAPP Manual Section 3.5.2.3)

Matrix	Analytical Group	Sample Locations/ Identification Numbers	Analytical Method	Data Package Turnaround Time	Laboratory / Organization (name and address, contact person and telephone number)	Backup Laboratory/ Organization (name and address, contact person, and telephone number)
Soil and Aqueous QC samples	Site-related SVOCs and SIM PAHs, PCP, and PCP related compounds	See Worksheet # 18	SW-846 8270D and 8270D SIM	21 calendar days	Chino Ortiz Project Manager RTI Laboratories, Inc. 31627 Glendale Street Livonia, MI 48150 734-422-8000 cortiz@rtilab.com	None
	DRO		SW-846 8015B			
Soil and Aqueous QC samples	Dioxins/Furans	See Worksheet # 18	SW-846 8290A	21 calendar days	Cape Fear Analytical, LLC 3306 Kitty Hawk Road Suite 120 Wilmington, NC 28405 Chris Cornwell 910-795-0422	None

SAP Worksheet #31 -- Planned Project Assessments Table

(UFP-QAPP Manual Section 4.1.1)

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (title and organizational affiliation)	Person(s) Responsible for Responding to Assessment Findings (title and organizational affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (title and organizational affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (title and organizational affiliation)
Laboratory System Audit(1)	Every two years	External	DoD ELAP Accrediting Body	DoD ELAP Accrediting Body Auditor	Laboratory QAM or Laboratory Manager, RTI and CFA	Laboratory QAM or Laboratory Manager, RTI and CFA	Laboratory QAM or Laboratory Manager, RTI and CFA

1 - RTI and CFA are DoD ELAP accredited for all analytical groups and target analytes required for this project. The DoD ELAP accreditation letters are included in Appendix C.

SAP Worksheet #32 -- Assessment Findings and Corrective Action Responses

(UFP-QAPP Manual Section 4.1.2)

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (name, title, organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (name, title, organization)	Timeframe for Response
Laboratory System Audit	Written audit report	Charles Obrien, Laboratory QAM, RTI Mike Larkins, Laboratory QAM, CFA	Specified by DoD ELAP Accrediting Body	Letter	DoD ELAP Accrediting Body	Specified by DoD ELAP Accrediting Body

SAP Worksheet #33 -- QA Management Reports Table

(UFP QAPP Manual Section 4.2)

TYPE OF REPORT	FREQUENCY (daily, weekly monthly, quarterly, annually, etc.)	PROJECTED DELIVERY DATE(S)	PERSON(S) RESPONSIBLE FOR REPORT PREPARATION (title and organizational affiliation)	REPORT RECIPIENT(S) (title and organizational affiliation)
Data validation report	Per SDG	Within 3 weeks of receipt of laboratory data	DVM or designee, Tetra Tech	PM and project file, Tetra Tech
Major analysis problem identification (Internal Tetra Tech Memorandum)	When persistent analysis problems are detected by Tetra Tech that may impact data usability	Immediately upon detection of problem (on the same day)	CLEAN QAM, Tetra Tech	PM, CLEAN QAM, Program Manager, and project file, Tetra Tech
Project monthly progress report	Monthly for duration of the project	Monthly	PM, Tetra Tech	Navy RPM, Navy; CLEAN QAM, Program Manager, and project file, Tetra Tech
Laboratory QA Report	When significant plan deviations result from unanticipated circumstances	Immediately upon detection of problem (on the same day)	Laboratory PM, RTI and CFA	PM and project file, Tetra Tech

SAP Worksheet #34 -- Verification (Step I) Process Table

(UFP-QAPP Manual Section 5.2.1)

VERIFICATION INPUT	DESCRIPTION	INTERNAL/ EXTERNAL	RESPONSIBLE FOR VERIFICATION (name, organization)
Chain-of-Custody Forms	The Tetra Tech FOL or designee will review and sign the chain-of-custody form to verify that the samples listed are included in the shipment to the laboratory and that the sample information is accurate. The forms will be signed by the sampler, and a copy will be retained for the project file, Tetra Tech PM, and Tetra Tech Data Validators.	Internal	Sampler and FOL, Tetra Tech
	The Laboratory Sample Custodian will review the sample shipment for completeness and integrity and will sign accepting the shipment. The Tetra Tech Data Validators will check that the chain-of-custody form was signed and dated by the Tetra Tech FOL or designee relinquishing the samples and also by the Laboratory Sample Custodian receiving the samples for analyses.	Internal/ External	1 - Laboratory Sample Custodians, RTI and CFA 2 - Data Validators, Tetra Tech
UFP-SAP Sample Tables/Chain-of-Custody Forms	Verify that all proposed samples listed in the UFP-SAP tables have been collected.	Internal	FOL or designee, Tetra Tech
Sample Log Sheets	Verify that information recorded in the log sheets is accurate and complete.	Internal	FOL or designee, Tetra Tech
UFP-SAP/ Field Logs/ Analytical Data Packages	Ensure that all sampling SOPs were followed. Verify that deviations have been documented and MPCs have been achieved. Particular attention should be given to verify that samples were correctly identified, that sampling location coordinates are accurate, and that documentation establishes an unbroken trail of documented chain of custody from sample collection to report generation. Verify that the correct sampling and analytical methods/SOPs were applied. Verify that the sampling plan was implemented and carried out as written and that any deviations are documented.	Internal	PM or designee, Tetra Tech
UFP-SAP/ Analytical SOPs/ Analytical Data Packages	Ensure that all laboratory SOPs were followed. Verify that the correct analytical methods/SOPs were applied.	Internal	Laboratory QAM, RTI and CFA
UFP-SAP/ Laboratory SOPs/ Raw Data/ Applicable Control Limits Tables	Establish that all method QC samples were analyzed and in control as listed in the analytical SOPs. If method QA is not in control, the Laboratory QAM will contact the Tetra Tech PM verbally or via e-mail for guidance prior to report preparation.	Internal	Laboratory QAM, RTI and CFA

VERIFICATION INPUT	DESCRIPTION	INTERNAL/ EXTERNAL	RESPONSIBLE FOR VERIFICATION (name, organization)
UFP-SAP/ Chain-of-Custody Forms	Check that field QC samples listed in Worksheet # 20 were collected as required.	Internal	FOL or designee, Tetra Tech
EDDs/Analytical Data Packages	Each EDD will be verified against the chain-of-custody form and hard copy data package for accuracy and completeness. Laboratory analytical results will be verified and compared to the electronic analytical results for accuracy. Sample results will be evaluated for laboratory contamination and will be qualified for false positives using the laboratory method/preparation blank summaries. Positive results reported between the DL and the LOQ will be qualified as estimated. Extraneous laboratory qualifiers will be removed from the validation qualifier.	External	Data Validators, Tetra Tech

Notes: Verification includes field data verification and laboratory data verification. Verification inputs as per Worksheet # 34 will be checked.

SAP Worksheet #35 -- Validation (Steps IIa and IIb) Process Table

(UFP-QAPP Manual Section 5.2.2) (Figure 37 UFP-QAPP Manual) (Table 9 UFP-QAPP Manual)

Step IIa / IIb	Validation Input	Description	Responsible for Validation (name, organization)
IIa	SAP/ Sample Log Sheets	Sample Coordinates - Ensure that sample locations are correct and in accordance with the SAP proposed locations. Document any discrepancies in the final report.	PM, FOL, or designee, Tetra Tech
IIa	Chain-of-Custody Forms	Custody - Ensure that the custody and integrity of the samples was maintained from collection to analysis and the custody records are complete and any deviations are recorded. Review that the samples were shipped and store at the required temperature and sample pH for chemically-preserved samples meet the requirements listed in Worksheet #19. Ensure that the analyses were performed within the holding times listed in Worksheet #19.	Project Chemist or Data Validators, Tetra Tech
IIa/IIb	SAP/ Laboratory Data Packages/ EDDs	Ensure that the laboratory QC samples listed in Worksheet #28 were analyzed and that the MPCs listed in Worksheet #12 were met for all field samples and QC analyses. Check that specified field QC samples were collected and analyzed and that the analytical QC criteria set up for this project were met.	Project Chemist or Data Validators, Tetra Tech
		Check the field sampling precision by calculating the RPD for field duplicate samples. Check the laboratory precision by reviewing the RPD or percent difference values from laboratory duplicate analyses; MS/MSDs; and LCS/LCSD, if available.	
		Check that the laboratory recorded the temperature at sample receipt and the pH of the chemically preserved samples to ensure sample integrity from sample collection to analysis.	
		Review the chain-of-custody forms generated in the field to ensure that the required analytical samples have been collected, appropriate sample identifications have been used, and correct analytical methods have been applied. The Tetra Tech Data Validator will verify that elements of the data package required for validation are present, and if not, the laboratory will be contacted and the missing information will be requested. Validation will be performed as per Worksheet #36.	

Step IIa / IIb	**Validation Input**	**Description**	**Responsible for Validation** (name, organization)
IIb	SAP/ Laboratory Data Packages/ EDDs	Ensure that the LOQs listed in Worksheet #15 were achieved.	Project Chemist or Data Validators, Tetra Tech
		Discuss the impact of matrix interferences or sample dilutions performed because of the high concentration of one or more other contaminants, on the other target compounds reported as non-detected.	
		Summarize deviations from methods, procedures, or contracts in the Data Validation Report. If possible determine the impact of any deviation from sampling or analytical methods and SOPs requirements and matrix interferences effect on the analytical results. Qualify data results based on method or QC deviation and explain all the data qualifications.	

SAP Worksheet #36 -- Analytical Data Validation (Steps IIa and IIb) Summary Table

(UFP-QAPP Manual Section 5.2.2.1)

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIa and IIb	Soil and Aqueous Field QC Samples	Site related SVOCs, SIM PAHs, PCP, and PCP related compounds, DRO	A full (Level IV) data validation will be performed using criteria for SW-846 Methods 8270D and 8270D SIM, and 8015B listed in Worksheets #12, #15, #24, and #28, and the current DoD QSM. If not included in the aforementioned, then the logic outlined in the "USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic Data Review" EPA-540/R-99-008 (USEPA, October 1999) will be used to apply qualifiers to data.	Data Validation Specialist, Tetra Tech
IIa and IIb	Soil and Aqueous Field QC Samples	Dioxins/ Furans	A full (Level IV) data validation will be performed using criteria for SW-846 Method 8290A listed in Worksheets #12, #15, #24, and #28, and the current DoD QSM. If not included in the aforementioned, then the logic outlined in "USEPA National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review", (USEPA, 2005b) will be used to apply qualifiers to data.	Data Validation Specialist, Tetra Tech

SAP Worksheet #37 -- Usability Assessment

(UFP-QAPP Manual Section 5.2.3)

Data Usability Assessment
The usability of the data directly affects whether project objectives can be achieved. The following characteristics will be evaluated at a minimum. The results of these evaluations will be included in the project report. The characteristics will be evaluated for multiple concentration levels if the assessors determine that this is necessary. To the extent required by the type of data being reviewed, the assessors will consult with other technically competent individuals to render sound technical assessments of these DQI characteristics: **<u>Completeness</u>** o For each matrix that was scheduled to be sampled, the Tetra Tech FOL (or other person designated by the Tetra Tech PM) acting on behalf of the Project Team will prepare a table listing planned samples/analyses compared to collected samples/analyses. If deviations from the scheduled sample collection or analyses are identified the Tetra Tech PM and Project Risk Assessor will determine whether the deviations compromise the ability to meet project objectives. If they do, the Tetra Tech PM will consult with the Navy RPM and other Project Team members, as necessary (determined by the Navy RPM), to develop appropriate corrective actions. **<u>Precision</u>** o The Tetra Tech Project Chemist acting on behalf of the Project Team will determine whether precision goals for field duplicates and laboratory duplicates were met. This will be accomplished by comparing duplicate results to precision goals identified in Worksheets #12 and #28. This will also include a comparison of field and laboratory precision with the expectation that laboratory duplicate results will be no less precise than field duplicate results. If the goals are not met, or data have been flagged as estimated (J qualifier), limitations on the use of the data will be described in the project report. **<u>Accuracy</u>** o The Tetra Tech Project Chemist acting on behalf of the project team will determine whether the accuracy/bias goals were met for project data. This will be accomplished by comparing percent recoveries of LCS, LCSD, MS, MSD, and surrogate compounds to accuracy goals identified in Worksheet #28. This assessment will include an evaluation of field and laboratory contamination; instrument calibration variability; and analyte recoveries for surrogates, matrix spike, and laboratory control samples. If the goals are not met, limitations on the use of the data will be described in the project report. Bias of the qualified results and a description of the impact of identified non-compliances on a specific data package or on the overall project data will be described in the project report. **<u>Representativeness</u>** o A Project Scientist identified by the Tetra Tech PM and acting on behalf of the Project Team will determine whether the data are adequately representative of intended populations, both spatially and temporally. This will be accomplished by verifying that samples were collected and processed for analysis in accordance with the SAP, by reviewing spatial and temporal data variations, and by comparing these characteristics to expectations. The usability report will describe the representativeness of the data for each matrix and analytical fraction. This will not require quantitative comparisons unless the Project Scientist indicates that a quantitative analysis is required. **<u>Comparability</u>** o The Tetra Tech Project Chemist acting on behalf of the Project Team will determine whether the data generated under this project are sufficiently comparable to historical site data generated by different methods and for samples collected using different procedures and under different site conditions. This will be accomplished by comparing overall precision and bias among data sets for each matrix and analytical fraction. This will not require quantitative comparisons unless professional judgment of the Tetra Tech Project Chemist indicates that such quantitative analysis is required.

Sensitivity

- The Tetra Tech Project Chemist acting on behalf of the Project Team will determine whether project sensitivity goals listed in Worksheet #15 were achieved. The overall sensitivity and quantitation limits from multiple data sets for each matrix and analysis will be compared. If sensitivity goals are not achieved, the limitations on the data will be described. The Tetra Tech Project Chemist will enlist the help of the Tetra Tech Risk Assessor to evaluate deviations from planned sensitivity goals.

Project Assumptions and Data Outliers

- The Tetra Tech PM and designated team members will evaluate whether project assumptions are valid. This will typically be a qualitative evaluation but may be supported by quantitative evaluations. The type of evaluation depends on the assumption being tested. Quantitative assumptions include assumptions related to data distributions (e.g., normal or log-normal) and estimates of data variability. Potential outliers will be removed if a review of the associated data indicates that the results have an assignable cause the renders them inconsistent with the rest of the data. During this evaluation, the team will consider whether outliers could be indications of unanticipated site conditions. Consideration will be given to whether outliers represent an unanticipated site condition.

Describe the evaluative procedures used to assess overall measurement error associated with the project:

After completion of the data validation, the data and data quality will be reviewed to determine whether sufficient data of acceptable quality are available for decision making. In addition to the evaluations described above, a series of inspections and statistical analyses will be performed to estimate these characteristics. The statistical evaluations will include simple summary statistics for target analytes, such as maximum concentration, minimum concentration, number of samples exhibiting non-detected results, number of samples exhibiting detectable results, and the proportion of samples with detected and non-detected results. The project team members identified by the Tetra Tech PM will assess whether the data collectively support the attainment of project objectives. They will consider whether any missing or rejected data have compromised the ability to make decisions or to make the decisions with the desired level of confidence. The data will be evaluated to determine whether missing or rejected data can be compensated by other data. Although rejected data will generally not be used, there may be reason to use them in a weight of evidence argument, especially when they supplement data that have not been rejected. If rejected data are used, their use will be supported by technically defensible rationales.

For statistical comparisons and mathematical manipulations, non-detected values will be represented by a concentration equal to the sample-specific limit of detection. Duplicate results will be averaged for the purpose of representing the range of concentrations, and the average of the original sample will be used to represent the concentration at a particular sampled location.

Identify the personnel responsible for performing the usability assessment:

The Tetra Tech PM, Project Chemist, FOL, and Project Scientist will be responsible for conducting the listed data usability assessments. The data usability assessment will be reviewed with the Navy RPM and the IDEM RPM. If deficiencies affecting the attainment of project objectives are identified, the review will take place either in a face to face meeting or a teleconference depending on the extent of identified deficiencies. If no significant deficiencies are identified, the data usability assessment will simply be documented in the project report and reviewed during the normal document review cycle.

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APPENDIX A

HISTORICAL INFORMATION

PRELIMINARY REVIEW/VISUAL SITE INSPECTION REPORT
OF
NAVAL WEAPONS SUPPORT CENTER
CRANE, INDIANA
EPA ID IN5170023498

Prepared for:

U.S. Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, IL 60604

Prepared by

A. T. Kearney, Inc.
699 Prince Street
Alexandria, VA 22313

EPA Contract No. 68-01-7038
Work Assignment R05-02-45

March 1987

Kearney, Inc.
Alexandria, Virginia

APR 01 1987

March 30, 1987

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05-02-45 (P)

ATKEARNEY

Ms. Pat Vogtman
Regional Project Officer
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, IL 60604

Reference: EPA Contract No. 68-01-7038, Work Assignment No. R05-02-45, Naval Weapons Supply Center (NWSC), Crane, IN

Dear Ms. Vogtman:

Enclosed please find the Preliminary Review/Visual Site Inspection Report for the above-referenced facility. This report presents the results of the Preliminary Review (PR) and Visual Site Inspection (VSI) portions of the RCRA Facility Assessment (RFA) for this facility. The PR form, VSI trip report, VSI field notes, and VSI photo log are included as attachments to this report.

Based on a review of the available information and observations made during the VSI, 100 Solid Waste Management Units (CWMUs) and three other Areas of Concern were identified at the NWSC facility.

Groundwater contammination has been documented at the Old Burning Pit (SWMU 1), the McCormish Gorge (SWMU 2), the Rockeye Percolation Site (SWMU 5), the Demolition Range (SWMU 58), the Pest Control Area (SWMU 60), the Former Waste Oil Tank Site (SWMU 61), and the Rifle Range (SWMU 63). These units are currently undergoing groundwater assessment to determine the extent of contamination.

Based on the results of the PR and VSI, several units appear to warrant sampling to determine if there has been a release of hazardous wastes or constituents to the environment. These include the Rockeye Loading Area Sumps (SWMU 4), the Roads and Grounds Dump Area (SWMU 20), the PCP Dip Tank (SWMU 21), Building 126 Sump (SWMU 22), the Outside Truck Wash Rack (SWMU 33), the Oil Pan Wash Out/Disposal Rack (SWMU 36), the Cast High

498-7

Explosives Fill (SWMU 46), the Paint Shop Building (SWMU 52), the Old Sludge Drying Beds (SWMU 56), the Rifle Range (SWMU 65), Sedimentation Pond #1 (SWMU 64), Mine Fill A (SWMU 65), Mine Fill B (SWMU 66), the Composition Testing Building (SWMU 93), and the Building 106 Settling Pond (SWMU 100).

Because there has been documented contamination at the site, EPA may wish to consider a RCRA Facility Investigation (RFI) at this site. Alternately, further investigation under a sampling visit (SV) appears to be warranted at this facility. This SV should include the units discussed above.

Because of time constraints and controlled access at the site, several minor units could not be observed during the VSI. For units where insufficient information was available to draw conclusions regarding potential for release, the additional information needed has been identified under the sugested further actions for these units. It is anticipated that this information could be obtained during the sampling visit.

If you have any questions, please call me or Gayle Kline, the Work Assignment Manager.

Sincerely,

Gordon Bennett
Technical Director

Kay Breeden
Program Director

cc: [redacted]
G. Kline
D. Ruggery
V. Harris
J. Gers

PRELIMINARY REVIEW/VISUAL SITE INSPECTION REPORT
OF
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Work Assignment R05-02-45

March 1987

PRELIMINARY REVIEW/VISUAL SITE INSPECTION REPORT
OF
NAVAL WEAPONS SUPPORT CENTER
CRANE, INDIANA

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I. EXECUTIVE SUMMARY

A Preliminary Review (PR) and Visual Site Inspection (VSI) were performed to identify and evaluate solid waste management units (SWMUs) and other areas of concern at the Naval Weapons Support Center (NWSC) in Crane, Indiana. The potential for releases to the environment of hazardous waste or constituents was assessed and the need for further actions was evaluated.

The NWSC is a large facility (approximately 100 square miles) and is involved in a wide range of activities, providing materials and support services to the U.S. Navy. The facility is operated by two major tenants - the Crane Army Ammunition Activity (CAAA) and the Defense Reutilization and Marketing Office (DRMO) of the Navy. The CAAA is responsible for a number of activities at the facility including the manufacture and demilitarization of ammunition, storage and treatment of ammunition wastes, and providing general engineering support services. These activities result in the generation of a number of hazardous wastes including explosives contaminated sludge, explosive wastewater treatment sludges (K044), demilitarized munitions wastes, and spent solvents. The DRMO is responsible for the storage and resale of hazardous materials and hazardous wastes generated for the entire NWSC facility.

A total of 100 SWMUs and three Other Areas of Concern have been identified at NWSC as a result of this review. Five of these units are currently regulated under RCRA Interim Status. Due to time constraints during the VSI, some minor SWMUs were not observed. Conclusions regarding release potential to the various environmental pathways have been developed for those units which were observed during the VSI and for which sufficient information was available. Conclusions have not been developed for those minor units that were not observed during the VSI and for which insufficient information was available.

The following is a summary of the SWMUs and other areas of concerns identified during the PR and VSI. Units not observed during the visual site inspection are noted by an asterisk.

1. Old Burning Pit
2. McComish Gorge Dump
3. FS Smoke Storage Facility
4. Rockeye Loading Area Sumps
5. Rockeye Percolation Site
6. Rockeye Loading Area Wastewater Treatment Unit - Building 3004
7. Waste Carbon Container Storage Area Outside of Building 3004
8. Paint Waste Container Storage Area at the Rockeye Loading Area
9. Active Solid Fill Site
10. Old Solid Fill Site
11. Above-ground Waste Oil Storage Tank - Building 2801
12. Classified Papers Incinerator - Building 45

*13. Building 136 Sump

*14. Wastewater Treatment Unit (lead) - Building 136

15. Wastewater Treatment Unit - Plating Shop-Building 3064
16. Drum Storage Area behind Building 3064
17. Battery Shop Dump Building 36
18. Acid Neutralization Pit

*19. PCB Burial Area - (Pole Yard)

20. Roads and Grounds Dump Area

21. PCP Dip Tank

22. Building 126 Dump

*23. Dust Collectors - Building 126

24. Scrap Storage Area Behind Building 126

*25. Red Phosphorous Building Sump - Building 1886

26. Building 133 Sump

27. Railroad Maintenance Shop Wash Area Building 7

28. Railroad Maintenance Shop Oil/Water Separator

29. Auto Maintenance Shop - Building 1820

30. Heavy Equipment Maintenance Shop - Building 1818

31. Truck Wash Area at the Heavy Equipment Maintenance Building

32. Oil/Water Separator at the Heavy Equipment Maintenance Building

33. Outside Truck Wash Rack Adjacent to Building 1818

34. Roll - Off Boxes Outside Building 1820

35. CONEX Hazardous Waste Transfer Containers behind Building 1820

36. Oil Pan Wash Out/Disposal Rack Adjacent to Building 1820

37. Underground Waste Oil Storage Tank -- Building 1818

38. Underground Waste Oil Storage Tank -- Building 1820

*39. Mechancial Maintenance Shop -- Building 56

*40. 400 Gallon Solvent Storage Tank (Building 56 Paint Shop)

*41. Red Phosphorous Mixing Emergency Sump

*42. Booster Area - Lead Azide Sumps - Building 106 and 107

43. Wastewater Treatment Unit Building 3074

44. Lead Azide Loading Pond

45. Open Storage Area Outside Building 2801

*46. Cast High Explosives Fill (Building 146)

47. Central Storage Facility

48. APE 1236 Incinerators Building 146

49. Prototype Incinerator Building 146

50. Defense Reutilization and Marketing Office (DRMO) Hazardous Waste Storage Area

51. DRMO Storage Lot

*52. Paint Shop Building 2889

*53. Load and Fill Area -- Buildings 105, 198 and 200

*54. Wastewater Treatment Unit Building 160

55. Wastewater Treatment Unit - Sewage Plant - Building 3049

56. Old Sludge Drying Beds

57. Sewage Sludge Vacuum Truck and and Discharge Pad

58. Demolition Range

59. Waste Explosive Storage Area at the Demolition Range

60. Pest Control Area Building 2189

61. Former site of Waste Oil Underground Storage Tank near the Pest Control Area

62. Drum Storage Area Adjacent to SWMU #61

63. Rifle Range

64. Sedimentation Pond #1

65. Mine Fill A

66. Mine Fill B

*67. Wastewater Treatment Unit - Building 104

68. Explosive D Wash Areas

*69. Load and Fill Area Sumps Building 104

*70. Steam Out Unit - Building 160

71. Highway 58 Dump Site A

*72. Storage Tanks - Building 160

*73. Bomb Proof Group

74. DRMO Salvage Yard

*75. Heavy Equipment Storage Area - Building 2189

76. Sanitary Sewer System

*77. Turkey Creek Quarry

78. Highway 58 Dump Site B

79. Ammunition Burning Grounds (ABG)

80. Sludge Dewatering Units (ABG)

81. Underground Storage Tanks (ABG)

82. Ash Pile (ABG)

83. Ash Roll-off Boxes (ABG)

84. Open Burning Area (ABG)

85. Dye Burial Grounds

86. Sanitary Landfill

87. Sanitary Landfill Leachate Collection Ponds

88. Sewage Sludge Land Application Area (Landfarm)

89. PCB Storage Facility

90. Sedimentation Ponds 2, 3, and 4

91. Pyro Test Area (Ordnance Testing Area)

*92. Test Track

*93. Composition Testing Facility - Decontamination Building 181

94. Rocket Range

95. Restored Mustard Gas Burial Area

96. Temporary Flammable

*97. Metal Shavings Collection Area

*98. 500 Gallon Tank Wagon

*99. 3-Ton Pump Truck

100. Settling Pond behind Building 106

OTHER AREAS OF CONCERN

A. Underground Diesel Fule/Gasoline Tanks
B. Stream East of McComish Gorge
C. White Phosphorous to Phosphoric Acid Production Building

*Units not observed during the VSI

II. INTRODUCTION

This report presents the results of the preliminary review (PR) and visual site inspection (VSI) performed for the NWSC facility. The PR and VSI were performed at this facility to identify and assess the potential for releases to the environment from SWMUs and other areas of concern. This report was developed using the U.S. EPA's RCRA Facility Assessment Guidance Document.

The information reviewed in preparing this report includes data obtained from EPA Region V and the Indiana State Board of Health including the Part A and Part B permit applications, the SWMU response letter, and available inspection reports. Additional information was obtained through a visual site inspection of the facility conducted on February 17th through 20th.

III. FACILITY AND PROCESS DESCRIPTION

The Naval Weapons Support Center (NWSC), Crane, is located on a 62,463 acre site in southwestern Indiana (Ref. 6, p.B-1). The facility is situated primarily in Martin County and extends into Davies, Green, and Laurence counties, 75 miles southwest of Indianapolis and 75 miles northwest of Louisville, Kentucky. The nearest metropolitan area is Bloomington which is 25 miles northeast of the site (Ref. 6, p.B-1). Figure 1 represents the general location of the NWSC.

The facility operates to "provide material, technical, and logistic support to the Navy" (Ref. 15, Section III). Operations began at NWSC on January 27, 1941 (Ref. 11, p.1). NWSC employs approximately 4,400 people in twenty-one departments and six tenant activities (Ref. 15, Section III). One segment of NWSC's mission is to assist the Crane Army Ammunition Activity (CAAA) who is a tenant on the facility. The CAAA employs 1300 people and is tasked with the "production and renovation of conventional ammunition and related items," engineering and product quality assurance, and the storage, shipment, demilitarization, and disposal of "conventional ammunition and related components" (Ref. 15, Section III).

A variety of hazardous and nonhazardous wastes are generated, stored, treated, and disposed at NWSC. These wastes include: explosive contaminated sludges, residues from munition demilitarization, metal plating wastewater, waste oils, and spent solvents. Explosive contaminated sludges result from the production of ammunition. The sludges are transported by vacuum truck to dewatering surface impoundments (Sludge Dewatering Units (Unit 80)) where the aqueous portion of the sludge is allowed to percolate into underground collection tanks (Unit 81) and the dried residual material is burned in-place. Open burning (thermal treatment) of explosive contaminated material, ordnance, propellant contaminated material, and pyrotechnic loaded items is carried out on the Old Rifle Range (Unit 63) and the Ammunition Burning Grounds (Unit 79) (Ref. 5). Controlled burning of ordnance is accomplished with the use of two 1236 APE Rotary

Incinerators (Unit 48) and one Prototype Rotary Incinerator (Unit 49) (Ref. 5). Prior to 1980, explosive contaminated wastewater was discharged to nearby streams. Presently, this wastewater is treated at various on-site, facility owned, wastewater treatment plants prior to eventual NPDES outfall. Other waste handling processes at NWSC include the treatment of metal plating wastewater and the storage of used oils and waste solvents. The metal plating wastewater is pretreated at the metal plating shop prior to discharge to the facility's sanitary sewer system. Waste oils are stored in two underground tanks at the maintenance shops and in an above-ground storage tank outside of Building 2801. Waste solvents are containerized and stored at the Central Storage Facility.

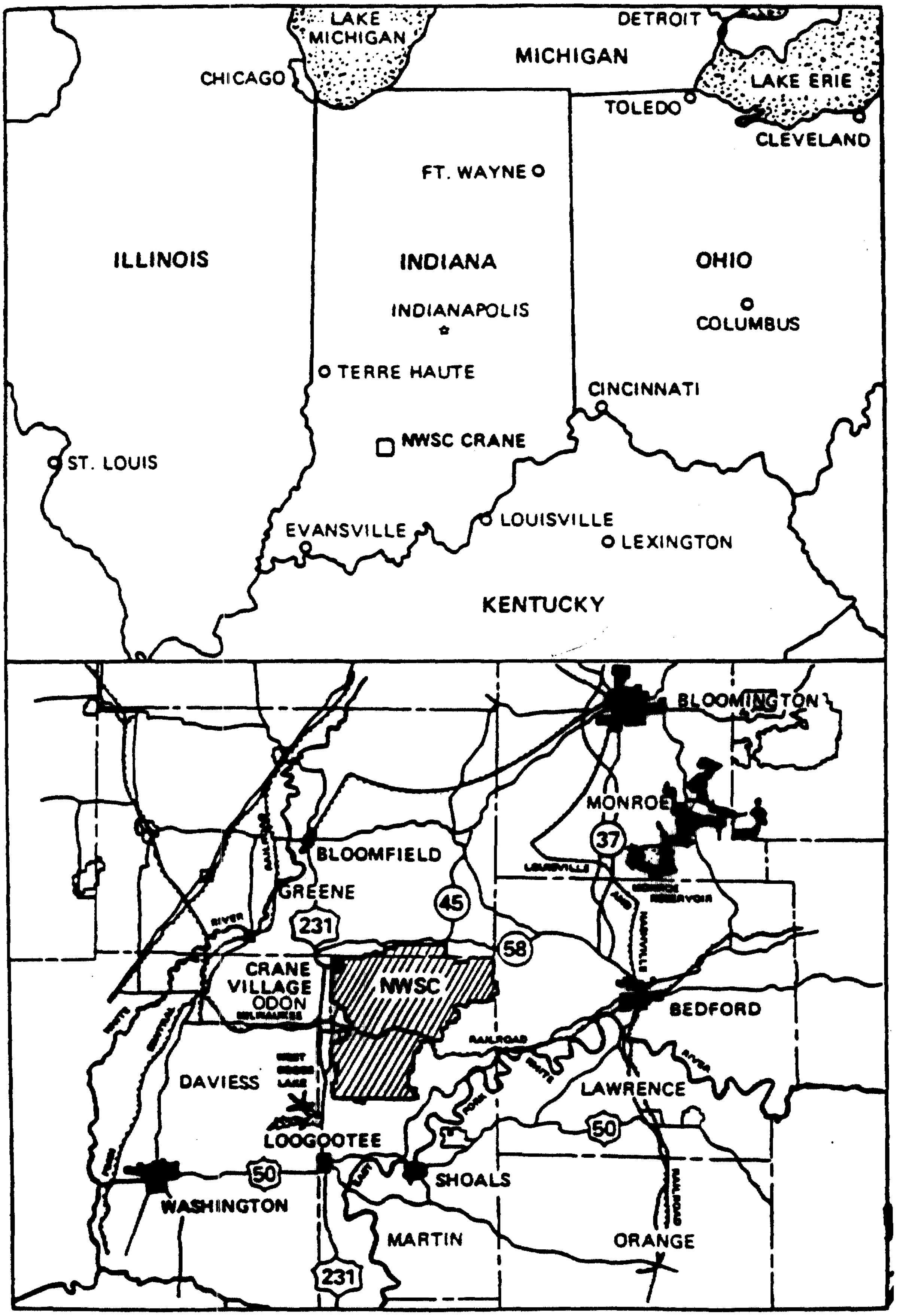

Figure 1: NWSC and Vicinity

IV. ENVIRONMENTAL SETTING

A. Meteorology

The NWSC is located in a temperate climate zone with an average of 44 inches of precipitation annually (Ref. 3, p.5-6). Temperatures vary widely throughout the year with a mean winter low temperature of 26 degrees farenheit and a mean summer high temperature of 89 degrees farenheit. The humidity is generally high, ranging from 40 to 90 percent (Ref. 3, p. 5-6). Winds in southwestern Indiana are generally from the south southwest at an average speed of 8.2 mph (Ref. 21, p.354).

B. Floodplain and Surface Water

The facility is characterized by well developed dendritic surface drainage (Ref. 3, p. 5-19). There are five drainage basins, consisting of seven streams, that carry surface water off site (Ref. 4, p.14). Flow within the drainage basins is generally toward the southwest. The following is a list of drainage basins and the general area that each encompasses within the site (Ref. 4, p.14).

Drainage Basin	Streams Within Basin	Site Drainage Area
Basin I	Furst Creek	Northwest Section
Basin II	Indiana Creek	Extreme Eastern Section
Basin III	Sulphur Creek Little Sulphur Creek	Eastern Section
Basin IV	Boggs Creek Turkey Creek	Central, Southcentral Sections
Basin V	Seed Tick Creek	Southwestern Section

Boggs Creek and Turkey Creek provide the primary surface drainage pathways for the facility. The facility's water supply is from Lake Greenwood in the northwest corner of the site. Lake Greenwood is an 800 acre spring fed lake that discharges to Furst Creek (Ref. 3, p.5-19). Figure 2 provides the location of the surface drainage basins at NWSC.

Sections of facility property bordering the surface drainage routes at NWSC are within the 100 year floodplain. According to NWSC's Part B Permit Application, there are no hazardous waste units located within the 100 year floodplain (Ref. 6, p.B-7).

C. <u>Geology and Soils</u>

The NWSC is underlain by sedimentary rocks of lower Pennsylvanian and upper Mississippian Ages. With the exception of minor outwash and lacustral deposits in the northwest corner of the facility, there are no Pleistocene glacial deposits covering the site (Ref. 19). Surface deposits at NWSC consist of recent (Holocene) and Pleistocene unconsolidated alluvial silt, sand, and gravel and residual soils developed from the underlying rock (Ref. 4, p.10).

The soils covering the NWSC belong to the Zanesville and Muskingum Soil Series (Ref. 4, p. 10). These soils are characterized as dark organic silt loams with underlying mottled tan to gray clay with varying percentages of silt and sand. Soil thickness is variable with values ranging from less than one foot to over 40 feet (Ref. 4, p. 10).

The sedimentary bedrock beneath the facility dips gently to the west southwest. The inclination of the strata reflects NWSC's location on the eastern flank of the Illinois Basin. This section of the basin is comprised of Pennsylvanian and Mississippian strata consisting of shale, sandstone, limestone, and coal (Pennsylvanian) beds. The Pennsylvanian Mansfield Formation (Racoon Creek Group) unconformably overlies the Mississippian Stephensport and West Baden Groups (Ref. 18, Plate No. 1 and p. 151) at the site.

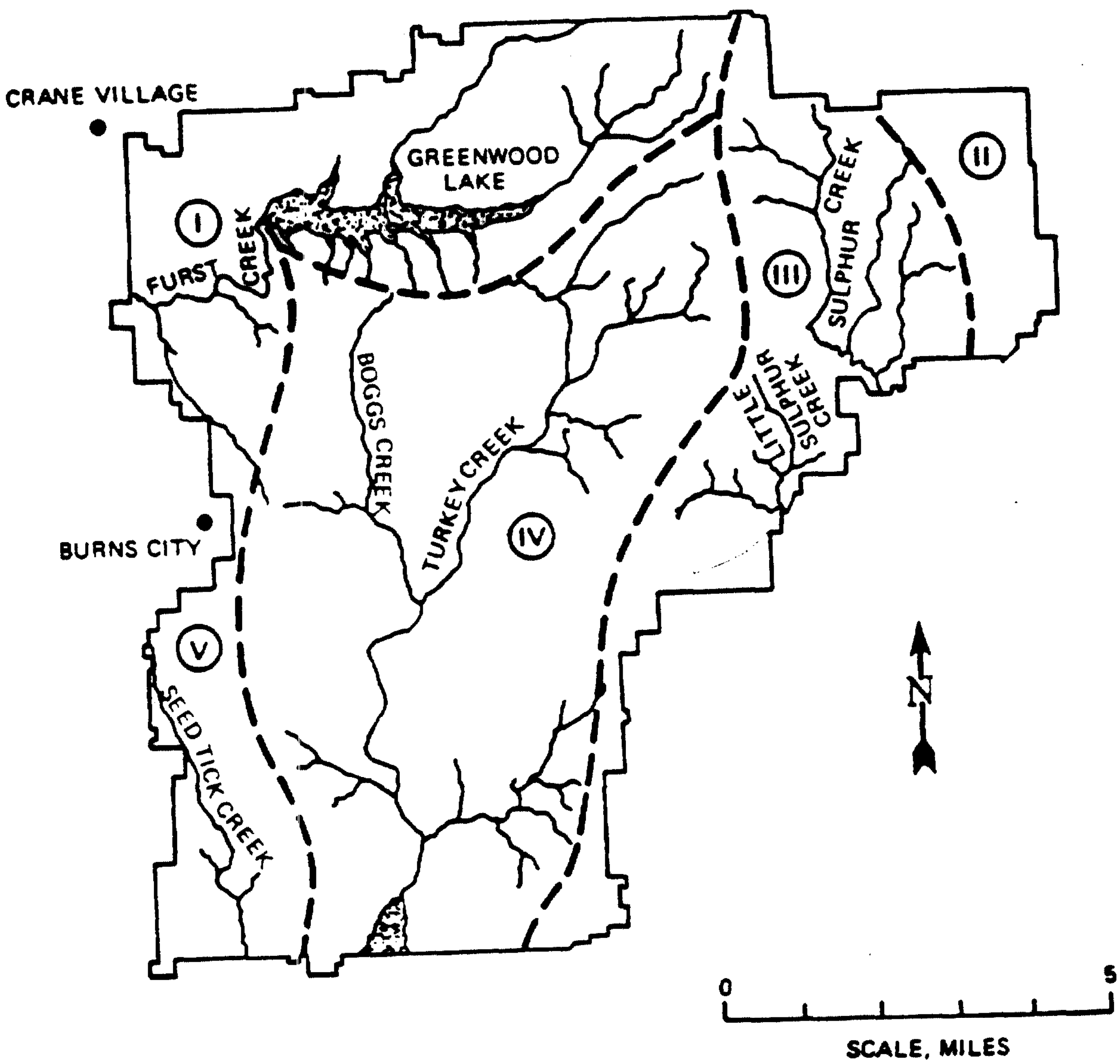

Figure 2 Surface Drainage at the NWSC (Ref. 3, p.5-21)

The Mansfield Formation has two distinct vertical divisions (Ref. 18, p.86). The lower division is comprised primarily of sandstone while the upper division consists of predominantly shale and mudstone (Ref. 18, p.86). Thin bituminous coal beds are prevalent throughout the formation.

The Stephensport Group conformably overlies the older West Baden Group. The Stephensport Group has five formations of which three are limestones and two are interbedded shale/sandstone formations (Ref. 18, Plate No. 2, p.13, 52, 56, and 87). Similarly the West Baden Group consists of the alternating carbonate/clastic lithology characteristic of the Stephensport Group with one exception. There is a noticeable lack of limestone tracer beds within a southwest trending linear area of the West Baden Group. This area, that outcrops northeast of the site, is referred to as the West Baden Clastic Belt (Ref. 18, p.43). The Belt consists of sandstone with adjoining bands of silty to sandy shale within the Elivren Formation (Ref. 18, p.43).

D. Groundwater

Groundwater resources at NWSC have not been studied extensively because the facility utilizes surface waters from Lake Greenwood for human consumption, process operations, and recreation. However, the existing lithologies, occurrences of springs and seeps, and the well developed surface drainage indicate the existence of groundwater that is hydraulically connected to the surface environment.

According to a Naval Assessment and Control of Installation Pollutants (NACIP) study, the groundwater at NWSC is divided into two regimes: one associated with soil/alluvial cover and the other associated with the bedrock (Ref. 3, p.5-22). This study reports that shallow groundwater is generally transient occurring during high precipitation periods. Free water within alluvial deposits is likely to percolate into bedrock or be discharged into intermittent streams along alluvial - bedrock contacts (Ref. 3, p.5-22). Table 1 is adapted from the NACIP study, it exhibits the general water bearing properties of the alluvial deposits and bedrock at NWSC.

Table 1: Water-Bearing Properties of Geologic Deposits at NWSC

(Adapted from Ref. 3, p.5-23, 23)

Geologic Unit	Description	Water Bearing Properties
Qsa	Clay, silt, sand, and gravel deposited by present streams. Organic materials are abundant in places. Limited to valley areas and variable in thickness; thicker along major streams than on minor ones. Generaly less than 15 feet thick. Along many major streams this deposit overlies deposits of outwash gravel, Qgv. Also associated with lake deposits, Qcl/Qsl, and older alluvial deposits, Qsi.	Deposits are permeable and yield some water. Major natural resource where associated with and underlain by valley-train gravel, Qgv, an excellent aquifer.
Qcl	Silt, clay, and sand of former lake areas. In southern Indiana, deposits occur as terraces or as extensive flats, mostly in valleys tributary to major streams. As thick as 150 feet near junction of Ohio and Wabash Rivers. Thinner elsewhere and upvalley; average thick ness 40 feet. In northern Indiana, deposits are broader and generally less than 40 feet thick. Associated with present alluvium, Qsa, and older alluvial deposits, Qsi.	Deposits contain much water, but permeability is low and water cannot be produced in quantity adequate for any use.
Qgv	Gravel, sand, and silt deposited by glacial meltwater; materials are stratifield. Valley-train deposits, Qgv, are long, narrow, and as much as 100 feet thick, along major present or former drainageways and associated with present alluvial deposits, Qsa. Common thickness, 20 to 40 feet. Outwash-plain deposits, Qgp, are broadand 10 to 40 feet thick.	Major natural resource. Deposits are important aquifers. Especially high yields are possible near bodies of surface water that provide continuous recharge. Infiltration areas should be protected from contamination.

Table 1: Water-Bearing Properties of Geologic Deposits at NWSC (Continued)

Geologic Unit	Description	Water Bearing Properties
Racoon Creek Group (Mansfield Formation)	Shale, sandstone, limestone clay, and coal. Maximum thickness 450 feet south, 100 feet north. Forms surface unit in much of outcrop area; remainder is covered by unconsolidated deposits, principally Qt, Qti. Underlain by the West Baden Group (north) through Lower Buffalo Wallow Group (south). About 55% shale, 40% sandstone, 5% other rock types. Coalbeds are as thick as 7 feet in some areas. Clay beds as thick as 10 feet underlie coals. Limestone beds are 3 to 10 feet thick.	Wells in thick sandstone beds in lower part of unit may yield water in quantity adequate for domestic, light industrial, or small municipal use. Quality is generally good, but in areas of surface and underground coal mining, contamination may be severe. Principal contaminants are sulphur and iron. Sulphur content, principally as sulphate, may be as high as a few thousand parts per million; iron content may be as high as 50 parts per million.
Stephensport Group	Limestone, sandstone, and shale. Maximum thickness 200 feet where overlain by the Lower Buffalo Wallow Group; thins and is unconformably overlapped northward where overlain by the Mansfield Formation. Forms surface unit in most of outcrop area. About 40% limestone, 35% sandstone, 25% shale, all in beds 10 to 30 feet thick. Stephensport Group; includes Glen Dean Limestone, Hardinsburg Formation, and Beech Creek Limestone.	Springs and wells in limestone and sandstone yield water in quantity generally adequate for domestic use. High bacterial contamination is common in water from limestone because rapid circulation through large open joints and solution features readily brings contaminants from ground surface. Total hardness (principally calcium bicarbonate) may be several hundred parts per million.

Geologic Unit	Description	Water Bearing Properties
West Baden Group	Shale, sandstone, and limestone. Maximum thickness 150 feet where overlain by the Stephensport Group; thin and is unconformably overlapped northward where overlain by the Mansfield Formation. Forms surface unit in most of outcrop area. About 40% shale, 35% sandstone, 25% limestone, all in beds 5 to 20 feet thick. West Baden Group; includes Elwren Formation, Reelsville Limestone, Sample Formation, Beaver Bend Limestone, and Bethel Formation.	Same as the Stephensport Group.

Due to the lateral lithologic transitions, the hydraulic isolation between alternating sedimentary series is not probable. Groundwater within the bedrock is likely to continue percolating downgradient until a permanent zone of saturation is reached (Ref. 3, p.5-28). Dependent on potentiometric heads, groundwater could also have a vertical flow component as it moves downgradient. Generally, the direction of groundwater flow should be controlled by the regional dip toward the west and will locally follow the topography. Shallow groundwater at the Ammunition Burning Grounds (ABG) flows toward the east and southeast (Ref. 6, p. E-10).

E. Receptor Information

The facility is located in a rural setting. The NWSC encompasses over 100 square miles of which eighty percent is classified as Central Hardwoods Forest (Ref. 3, p.5-29). The land adjacent to the facility consists of woodlands and small farms (Ref. 3, p.5-6). Four small towns serve the general NWSC area: Crane Village, Odon, and Loogootee to the west and south-west, and Bedford to the east of the facility. The nearest metropolitan Center is Bloomington, twenty five miles to northeast of NWSC.

The facility employs approximately 4400 people (Ref. 15) who either live on base or have passes to enter the facility. Entrance without authorization is not permitted at NWSC. Lake Greenwood is a source of potable water and provides recreation for facility personnel.

V. RELEASE PATHWAYS

A. Groundwater

Releases of hazardous constituents to groundwater are a major concern at the NWSC. According to the facility's Part B Permit Application, nine RCRA interim status monitoring wells were installed at the Ammunition Burning Grounds (ABG) in 1981 and four additional wells were installed in 1983 (Ref. 6, p.E-2).

The wells have defined the presence of shallow groundwater within permeable lenses of overburden, unconfined groundwater within the Hardinsburg Formation (uppermost aquifer), and unconfined groundwater within a sandstone unit of the Big Clifty Formation below the shale aquitard on which the Hardinsburg water-bearing zone rests (Ref. 6, p.E-9, 10). Monitoring data from the nine original wells at the ABG indicated a "statistically significant" increase in TOX and TOC for wells 3-1, 3-4, 3-5, and 3-9 (Ref. 6, p.E-6). This increase in indicator parameters was identified in the uppermost aquifer. According to the Permit Application there is no available information on the possible hydraulic connection between the uppermost bedrock aquifer and water bearing zone beneath it (Ref. 6, p.E-12).

The existence of permeable stream bottoms and springs at the facility indicate the potential for release to surface water via groundwater recharge. The NACIP study concludes (without well data) that Boggs Creek may intercept groundwater but most will flow down-dip westward off-site (Ref. 3, p.5-28). Also, stream recharge of groundwater could contaminate groundwater in the event of release to surface water.

As a result of the NACIP study, several groundwater monitoring systems have been installed around historical waste disposal areas. Facility representatives reported during the VSI that there are over 200 monitoring wells on base (Ref. 20).

B. Soils

Due to the open burning, and present and past land application of wastes, in combination with permeable alluvium, there is a high potential for soil contamination in the waste management areas. Contamination of soil and subsequent migration of contaminants into the surface water and groundwater is likely at the NWSC.

C. Surface Water

The well developed drainage network and level of precipitation at NWSC promote the run-off of any pollutants deposited on the surface at the site (Ref. 3, p.5-28). Numerous streams and fine grained alluvial material increase the erosional potential of areas in which wastes are disposed. Sedimentation Ponds (Units 64 and 90) have been constructed on each side of the Demolition Range (Unit 58) to collect potentially contaminated run-off from the area (Ref. 20). However, most of the land based units have no surface release controls. The site has 14 NPDES outfalls (Ref. 6, p.J-2), and operates under NPDES permit IN0021539 (Ref. 5).

D. Air Emissions

The open burning and controlled incineration of explosives at NWSC creates the potential for release to the air. The facility has four variances and six permits for air discharges. The following table summarizes the regulated air releases at the NWSC.

Table 2: Air Variances and Permits at NWSC
(Adapted from: Ref. 6, p.J-1)

A. Variances:

(1) APC 2-1426 -- detonation of lithium thionyl chloride and sulfur dioxide batteries at Demolition Range.

(2) APC 2-1430 -- burning of explosive-contaminated waste, waste explosives, pyrotechnics-contaminated waste and waste pyrotechnics at the Ammunition Burning Grounds and detonation of explosive materials at the Demolition Range.

(3) APC 2-1521 -- testing of specific production smoke and flare signals markers in an area behind Building 2167.

(4) APC 2-1506 -- testing of specific smoke and flare signals/markers at the Ordnance Test Area, Rocket Range and Building - 198.

B. Permits:

The State of Indiana had proposed the following six air permits at NWSC. (No further information was provided by the Part B Application.)

1. #51-05-88-0028
2. #51-05-88-0029
3. #51-05-88-0030
4. #51-05-88-0031
5. #51-05-88-0032
6. #51-05-88-0033

During the VSI, open burning of magnesium explosives was taking place with large clouds of grayish-white smoke being produced. This smoke was evident over a mile from the during area at ground surface along Highway 331 (Ref. 20).

E. Subsurface Gas

The NWSC practices land application of its sanitary sewage sludge and has a sanitary landfill. Due to the nature of the wastes stored and disposed on-site there is no potential for generation of subsurface gas except from the sanitary landfill.

VI. SOLID WASTE MANAGEMENT UNITS (SWMUs)

The Solid Waste Management Units are listed in numerical sequence according to geographic location within facility designated quadrants. The facility is divided into 24 quadrants with Section 1 in the northwestern most corner and Section 24 in the southeastern most corner. Units marked by an asterisk (*) were not observed during the VSI and any information on those units does not reflect visual inspection of the units. Figure 3 is the grid location map of the NWSC facility. Appendix C provides a detailed SWMU Location Map.

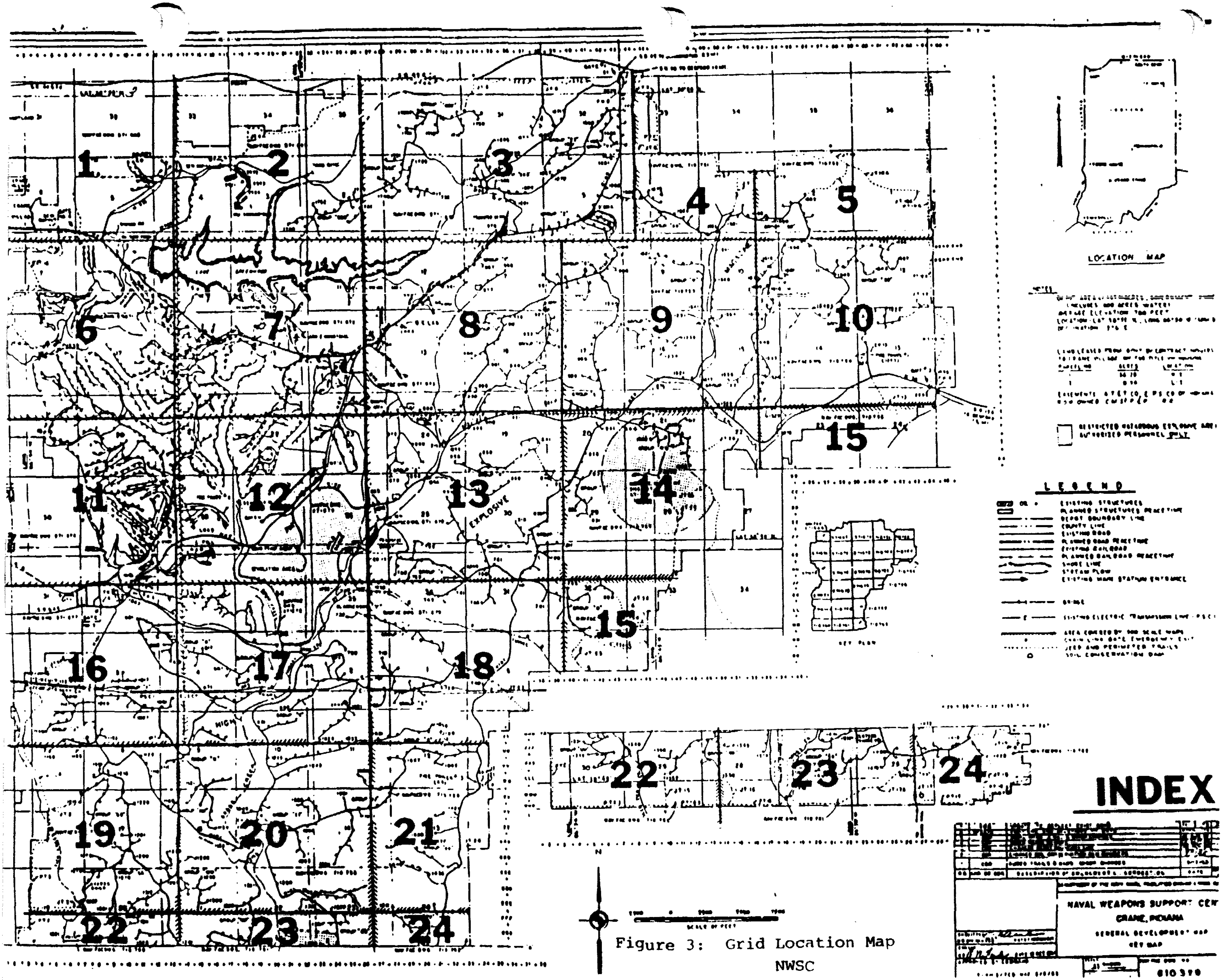

Figure 3: Grid Location Map
NWSC

Section 1

1. UNIT NAME: Old Burning Pit (Ref. 2, p.3)

Unit Description: This unit is located southeast of H331 along an abandoned rail spur. The unit was a natural depression that is presently covered by grass and scrub pine trees (Ref. 20). A small intermittent stream flows through the unit's interior.

Date of Start-Up: The unit became active in 1942.

Date of Closure: The unit became inactive in 1972.

Waste Managed: This unit was the site for burning plant trash and garbage. Residue from the pit and remaining metallics were buried in a gulley north of the unit. This gulley is considered part of the unit. It also received non-burnable wastes such as refrigerators and transformers (Ref. 20).

Release Controls: The unit was an unlined natural depression (ravine) near the Culpepper Branch of Furst Creek.

Release History: The unit has a series of 19 groundwater monitoring wells around it. Trans-1, 2 DCE, Chloroform and TCE have been detected in concentrations exceeding 50 ppb (Ref. 13, p.71). The contaminant plume has a width of approximately 80 to 195 ft. and a length of 500 ft. The plume is moving to the northwest (Ref. 13, p.71).

UNIT 1. (Continued)

Conclusions:	Soil/Groundwater: There is documented release to groundwater from this unit. The potential for continuing release to groundwater from this unit is high due to the wastes materials buried and the fact that the unit is not lined or capped. Surface Water: The potential for release to surface water from this unit is moderate to high due to the stream drainage through the gulley where disposal took place. Air: The potential for release to air from this unit is low due to the nature of the wastes buried and the condition of the unit. Subsurface Gas: The potential for generation of subsurface gas from this unit is low due to the nature of the wastes buried.
Suggested Further Action:	The facility is currently monitoring the groundwater at this unit as part of the Installation Restoration Program. Continued monitoring of groundwater quality should be performed to determine nature and extent of contamination.

2. UNIT NAME: McComish Gorge Dump (Ref. 3, p.2-1)

Unit Description: This unit was a natural ravine along a tributary to Furst Creek in the northwest corner of the facility. It is presently backfilled and brush covered with elevated mounds of soil along the north and east sides (Ref. 20).

Date of Start-Up: Unknown.

Date of Closure: The unit is inactive. Exact date of closure is unknown.

Waste Managed: General garbage and some ordnance material were disposed of in the unit (Ref. 20).

Release Controls: The unit was an unlined natural depression.

Release History: The unit has six monitoring wells in place around it. Monitoring data from the wells was not available for review.

Conclusions: <u>Soil/Groundwater</u>: The potential for release to groundwater from this unit is high due to the wastes disposed of in the unit and the fact that it was unlined.

<u>Surface Water</u>: The potential for release to surface water from this unit is low due to the separation of the unit from the adjacent stream by an elevated ridge and the well-established vegetative cover.

<u>Air</u>: The potential for release to air from this unit is low due to the wastes disposed of in the unit and the units present condition.

<u>Subsurface Gas</u>: The potential for generation of subsurface gas from this unit is low to moderate dependent on the nature of the reported "garbage" disposed of in the unit.

Suggested Further Action: Continued assessment of groundwater quality should be performed to determine the extent of contamination.

3. UNIT NAME: FS Smoke Storage Facility - Buildings 1008, 1815, 1816, 2646, and 1794 (Ref. 5)

Unit Description: These storage units were located in aluminum storage buildings with gravel floors (Ref. 7, p.1). Total storage capacity was 3900 drums. This unit was identified in the modification to the RCRA Part A Application. These drums were removed from the site and transferred to an off-site permitted treatment facility. This work was reported complete in February 1985 (Ref. 7, p.7).

Date of Start-Up: Unknown.

Date of Closure: The drums were removed from the site in February 1985. The buildings are presently empty.

Waste Managed: Surplus FS Smoke (chlorosulfonic acid with sulfur trioxide) was stored in 55-gallon drums until taken off-site.

Release Controls: The drums were stored on gravel surface within aluminum shell buildings. A closure plan has been submitted to the State of Indiana (Ref. 20).

Release History: Unknown.

Unit 3. (Continued)

Conclusions: <u>Soil/Groundwater</u>: The release potential to soil/groundwater from these units was low due to management in containers and the nature of the wastes stored.

<u>Surface Water</u>: The release potential to surface water from these units was low due to management in containers within an enclosed building.

<u>Air</u>: The release potential to air in the past was dependent on the condition of the drums. Presently there is no potential for release to air because the drums have been removed.

<u>Subsurface Gas</u>: There is no potential for the generation of subsurface gas due to the above-ground nature of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

4. UNIT NAME: Rockeye Loading Area Sumps (Ref. 2, p.3)

Unit Description: The Rockeye Loading Area is a production facility that loads three inch bomblets. Wastewater is produced from the wash-out of bomb molds. The wastewater presently flows into four concrete sumps that hold wastewater for solids settling prior to pumping into the wastewater treatment system. The sumps are designated A, B, C, and D and are located outside of each building. Explosive contaminated sludge is removed from each sump via a vacuum truck and taken to the Ammunition Burning Grounds Sludge Dewatering Units (Unit 80) (Ref. 20). The sumps appeared to be in good condition during the VSI.

Date of Start-Up: Bomblet production began in 1967.

Date of Closure: These units are presently active.

Waste Managed: Wastewater contaminated with TNT, HMX, and RDX is collected in the sumps.

Release Controls: Prior to 1978, the process wastewater was discharged directly to surface water tributaries. In 1978, a wastewater pretreatment unit was installed.

Release History: In July 1983, process water was released to surface drainage. Monitoring wells 7 and 8 were installed to detect contamination from this release. Wells 7, 8 and 9 were identified as contaminated with RDX and HMX (Ref. 14, p. 17). Wells 3, 7, 8, 9, and 10 with RDX and HMX (Ref. 14, p.17).

UNIT 4. (Continued)

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater from these units is low due to the apparent good condition of the units.

Surface Water: The potential for release to surface water from these units is low due to the low volumes of wastewater produced from rinse operations and pumping into the wastewater treatment unit.

Air: The potential for release to air from these units is low due to the nature of the wastes.

Subsurface Gas: The potential for generation of subsurface gas is low due to the nature of the wastes and design of the unit.

Suggested Further Action:

1. Sediment contained in the surface water tributaries should be sampled to determine the extent of contamination from past practies.

2. Continued assessment of groundwater quality should be performed to determine the extent of contamination.

5. UNIT NAME: Rockeye Percolation Site

Unit Description: This unit was an open area where wastewater from the Rockeye Loading Area was allowed to percolate into the ground via unlined ditches (Ref. 3, p.6-29). The area is located north of the production buildings where drainage is into an intermittent stream.

Date of Start-Up: Assumed to be date of start-up of bomb loading, 1967 (Ref. 20).

Date of Closure: A wastewater pretreatment unit was installed in 1977 which rerouted the wastewater.

Waste Managed: Wastewater containing explosive contaminants; TNT, HMX and RDX from the rinsing operations of bomb molds was allowed to pond and infiltrate the ground.

Release Controls: In 1977, NWSC installed an activated carbon pretreatment system. Prior to 1977 the wastewater was allowed to "percolate" into the ground. Wastewater from Sump "C" was allowed to discharge to Turkey Creek prior to 1977.

Release History: Prior to 1977, a red hue was observed at Sulfur Creek due to process effluent from the Rockeye Area (Ref. 3, p.6-28). Presently, there are 5 monitoring wells around the former area of the site. Data from these wells was not available for review.

UNIT 5. (Continued)

Conclusions: Soil/Groundwater: Prior to 1977, the potential for release to soil and groundwater was high due to the percolation of wastes in unlined ditches.

Surface Water: The potential for release to surface water from this unit was high in the past because effluent was allowed to flow into Sulfur and Turkey Creeks. Presently, there is low potential for surface water release.

Air: The potential for release to air from this unit is low due to the nature of the wastes.

Subsurface Gas: The potential for generation of subsurface gas is low due to the nature of the wastes and the open nature of the unit.

Suggested Further Action:

1. Continued assessment of groundwater quality should be performed to determine the extent of contamination.
2. Contaminated soils should be sampled in the percolation site to determine the extent of contamination from past practices.

6. UNIT NAME: Rockeye Loading Area Wastewater Treatment Unit - Building 3004

Unit Description: This unit is a carbon-adsorption pretreatment unit that is located adjacent to the Rockeye Loading Area. It consists of an outside, above-grade concrete holding tank, paper roll filters, and three carbon adsorption columns. After treatment, wastewater is discharged to the Sanitary Sewer System (Ref. 20). The unit treats from 1.3 to 11.7 million gallons per year.

Date of Start-Up: 1977 (Ref. 20).

Date of Closure: The unit is presently active. The unit operates 8-10 months per year.

Waste Managed: The unit receives explosive contaminated wastewater (pink water) containing RDX, HMX, and TNT from the Rockeye Loading Area Sumps (Ref. 20).

Release Controls: Effluent from the waste pretreatment facility is discharged to the sanitary sewer. All treatment is located within an enclosed building with concrete floors except for the outdoor holding tank. Effluent from the unit is released to the sanitary sewer.

Release History: Spent carbon is drummed and stored separately outside of the building. All of the equipment appeared to be in good condition during the VSI.

UNIT 6. (Continued)

Conclusions: <u>Soil/Groundwater</u>: The potential for release to soil and groundwater from this unit is low due to the design characteristics of the unit.

<u>Surface Water</u>: The potential for release to surface water from this unit is low due to the treatment of wastes with carbon prior to discharge to the sanitary sewer system.

<u>Air</u>: The potential for release to air from this unit is low due to the nature of the wastes.

<u>Subsurface Gas</u>: There is no potential for the generation of subsurface gas due to the nature of the wastes and design characteristics of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

7. <u>UNIT NAME</u>: Waste Carbon Container Storage Area Outside of - Building 3004

<u>Unit Description</u>: This unit consists of waste carbon from the Wastewater Treatment Unit at the Rockeye Loading Area (Unit 6) in 55-gallon drums on wooden pallets. The pallets are on open ground adjacent to the treatment building. Approximately 25 drums were present during the VSI (Ref. 20).

<u>Date of Start-Up</u>: Assumed to be 1977 (Ref. 20).

<u>Date of Closure</u>: The unit is presently active.

<u>Waste Managed</u>: Containerized waste carbon, contaminated with explosives, is stored on wooden pallets before removal. Approximately 46,000 lb/year (140 drums) of waste carbon is produced. Prior to January 1986, the waste carbon was sent to the burning grounds. It is now sent off-site for disposal (Ref. 20).

<u>Release Controls</u>: The drums were elevated from the ground on wooden pallets with no secondary containment.

<u>Release History</u>: There was no visual evidence of any past spillage on the ground around the drums. The plastic drums were in good condition.

Conclusions: <u>Soil/Groundwater</u>: The potential for release to soil/groundwater from this unit is low due to the nature of the wastes and apparent good condition of the containers.

<u>Surface Water</u>: The potential for release to surface water is low due to the nature of the wastes and the unit's distance from any local surface drainage.

<u>Air</u>: The potential for release to air from the unit is low due to the nature of the wastes and good condition of the containers.

<u>Subsurface Gas</u>: There is no potential for generation of subsurface gas due to design characteristics of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

8. UNIT NAME: Paint Waste Container Storage Area at the Rockeye Loading Area

Unit Description: The unit consists of several steel 55-gallon drums on metal pallets outside of the south wall of one of the Rockeye production buildings. Drums are stored here for less than 90 days prior to removal to the Central Storage Facility (Unit 47) (Ref. 20).

Date of Start-Up: Assumed to be 1967, start-up of the Rockeye Area (Ref. 20).

Date of Closure: The unit is presently active.

Waste Managed: Paint residues and grit from reutilization efforts within the Rockeye area are drummed and placed on the pallets outside.

Release Controls: The unit rests on a macadam entry way to the Rockeye Loading Area.

Release History: Noticeable paint stains were noted on the pavement and one of the drums had an open bung during the VSI.

UNIT 8. (Continued)

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater from this unit is low due to the small volumes handled and its location on a paved surface.

Surface Water: The potential for release to surface water from this unit is low due to the containerization of wastes and its distance from any local surface drainage.

Air: The potential for release to air from this unit is low dependent on proper closure of containers stored.

Subsurface Gas: There is no potential for the generation of subsurface gas due to the design characteristics of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

9. UNIT NAME: Active Solid Fill Site

Unit Description: This landfill is an excavated hillside that covers 4 acres. The unit receives 10 yd^3 of construction debris per day. It is permitted by the State of Indiana (Ref. 20).

Date of Start-Up: January 1986

Date of Closure: This unit is presently active.

Waste Managed: Wastes managed at a the Solid Fill Site include demolition and construction debris (bricks, concrete, stone, glass, wallboard, lumber roofing materials and paper products). Approximately 10 yd^3 of wastes are disposed per day (Ref. 20).

Release Controls: The unit is an unlined fill with no controlling berm on its west side. The west side slopes toward a gulley below elevated railroad track (Ref. 20). Wastes did not appear to be regularly covered by excavated soil during the VSI.

Release History: There is no groundwater monitoring of this unit.

Conclusions:

<u>Soil/Groundwater</u>: The potential for release to soil/groundwater is low due to the nature of the wastes (i.e., wood, concrete, etc.) disposed of in the unit.

<u>Surface Water</u>: The potential for release to surface water is low due to the nature of the wastes disposed of in the unit.

<u>Air</u>: The potential for release to air is low due to the nature of the wastes disposed of in the unit.

<u>Subsurface Gas</u>: The potential for subsurface gas is low due to the nature of the wastes disposed of in the unit and the absence of clay capping of the wastes.

Suggested Further Action:

Based on the wastes disposed at the site, no further action is suggested for this unit at this time.

10. UNIT NAME: Old Solid Fill Site

Unit Description: This unit was a natural slope that was gradually filled in with construction debris. It covers 4 acres and is located just off Highway 344 in Section 6 (Ref. 20). It was never permitted by the State of Indiana (Ref. 20). The area is presently soil covered, graded, and has very sparse vegetation.

Date of Start-Up: The unit began operations in February 1982.

Date of Closure: The unit became inactive in January 1986. No closure plan is required by the State of Indiana, although the state is aware of planned closure activities (Ref. 20).

Waste Managed: Wastes managed at the Solid Fill Site included construction and demolition debris. The unit had received approximately 10,400 yds^3 of wastes (Ref. 20).

Release Controls: The unit was an unlined, unengineered fill of a hillside. It is presently "closed" with a soil cover and very sparse vegetation.

Release History: There is no groundwater monitoring of this unit.

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is low due to the nature of the wastes (i.e., wood, concrete, etc.) disposed of in the unit.

Surface Water: The potential for release to surface water is low due to the nature of the wastes disposed of in the unit.

Air: The potential for release to air is low due to the nature of the wastes disposed of in the unit.

Subsurface Gas: The potential for subsurface gas is low due to the nature of the wastes disposed of in the unit and the absence of clay capping of the wastes.

Suggested Further Action: Based on the wastes disposed at the site, no further action is suggested for this unit at this time.

11. UNIT NAME: Above-ground Waste Oil Storage Tank - Building 2801

Unit Description: This unit is a single shell steel tank with a capacity of 5,000 gallons. It is supported by 3 ft. concrete bolsters over a gravel pad with a 3 ft. high cement block retaining wall at its perimeter (Ref. 20). The unit is located outside of Building 2801.

Date of Start-Up: Unknown.

Date of Closure: The unit is presently active.

Waste Managed: The storage tank is used to store 4,000 to 6,000 gallons per year of waste oil collected from throughout the facility. The waste oil is stored until it is sold or used for boiler feed. The oil is transferred into the unit by a portable pump from small containers (i.e., drums, gallon jugs) (Ref. 20).

Release Controls: The unit is elevated from the ground surface and has a retaining wall. However, the surface beneath the tank is gravel.

Release History: There were no visual signs of leakage or spillage during the VSI.

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is presently low due to the apparent good condition of the tank. However, if leakage or spillage during transfer would occur, waste oil would be released to the soil beneath the gravel surface.

Surface Water: The potential for release to surface water is low due to the unit's retention wall and distance from local surface drainage.

Air: The potential for release to air is low due to the nature of the wastes and the closed construction of the tank.

Subsurface Gas: There is no potential for subsurface gas generation due to the design characteristics of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

12. UNIT NAME: Classified Papers Incinerator - Building 45

Unit Description: The incinerator has a capacity of 975 lbs/hour with an annual capacity of 80-100 tons per year (Ref. 1). It is located on a concrete pad with 8 ft. chain link fence at its perimeter. Wastes are ignited by a match (Ref. 20).

Date of Start-Up: 1962 (Ref. 1).

Date of Closure: The unit is currently active (Ref. 1).

Waste Managed: The incinerator burns classified papers and documents. Some old medical supplies including medication and bandages which have exceeded their shelf life have been burned (Ref. 20). No hazardous wastes have been identified to have been burned in the incinerator (Ref. 1). Ash from the incinerator is sent to the Active Solid Fill Site (Unit 9).

Release Controls: There are no apparent air release controls on the Unit (Ref. 20).

Release History: Unknown.

UNIT 12. (Continued)

Conclusions: <u>Soil/Groundwater</u>: The potential for release to soil/groundwater is low due to the unit's design characteristics and its location on a concrete pad.

<u>Surface Water</u>: The potential for release to surface water is low due to the unit's design characteristics and wastes managed.

<u>Air</u>: The potential for release of particulates to the air is low due to the small volume of wastes handled, and schedule of operation.

<u>Subsurface Gas</u>: There is no potential for the generation of subsurface gas due to the design characteristics of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

*13. UNIT NAME: Building 136 Sump (Ref. 3, p.6-10)

Unit Description: This 7 ft. x 8.5 ft. unit received wastes from the Lead Azide Production Building after the loading pond (Unit 44) became inactive. The unit was plugged in 1982 and a wastewater treatment unit (Unit 14) was installed. The unit was connected to the sanitary sewer; it had a flow rate of approximately 2300 gallons per week (Ref. 3, p.6-10).

Date of Start-Up: Unknown.

Date of Closure: The unit became inactive in 1982.

Waste Managed: Wastewater containing lead salts was discharged into the sump.

Release Controls: Unknown.

Release History: Unknown.

UNIT 13. (Continued)

Conclusions:	This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.
Suggested Further Action:	Obtain information on unit operation, release history, current status, and condition.

*14. UNIT NAME: Wastewater Treatment Unit (Lead) - Building 136

Unit Description: This unit contains two flocculation chambers and a sand filter, located in Building 136. It pretreats wastewater contaminated with lead compounds. The unit has a capacity of 6,700 gallons, and has been used "very little" (Ref. 1).

Date of Start-Up: 1980.

Date of Closure: This unit is currently inactive, it has been on standby operation since 1984.

Waste Managed: The unit treats wastewater contaminated with lead compounds. Hazardous waste constituents identified as K046 - wastewater from lead initiating compounds.

Release Controls: The wastewater treatment unit is surrounded by a berm.

Release History: Unknown.

Conclusions: This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.

Suggested Further Action: Obtain information on unit operation, release history, current status and condition.

15. UNIT NAME: Wastewater Treatment Unit - Plating Shop - Building 3064

Unit Description: This unit, located in Building 3064, pretreats plating wastewater. The capacity is 17,000 gallons. The unit treats wastewater generated from the zinc, cadmium, chrome, and phosphate plating of munition related metal parts and the acid/alkali cleaning of metal parts. It consists of two separate treatment lines, the chrome rinse line, and the cyanide treatment line (Ref. 20). The two lines dump into a below-grade sump designated the Acid/Alkali Holding Tank. Wastewater is then pumped into a pH adjustment tank and the supernatant is discharged to the sanitary sewer system. The resulting sludge is fed through a dewatering press and into a small hopper prior to containerization. One to two drums of cake sludge per day are dried and drummed as hazardous waste for off-site disposal. The water produced during dewatering is gravity fed back into the holding tank (Ref. 20).

Date of Start-Up: 1979.

Date of Closure: The unit is currently active.

Waste Managed: The unit pretreats metal plating wastewater which contains heavy metals, phosphates, and free cyanides prior to treatment.

Release Controls: All tanks except for the holding tank are above-grade and in good condition. They are located on a cement floor within an enclosed building. Floor drains are routed into the holding tank. No release controls for the underground tank were noted.

Release History: There was no visible sign of release during the VSI. However, the sludge hopper had a large hole in it that could cause spillage of sludge onto the floor (Ref. 20).

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is low due to the apparent good condition of the tanks and the fact that they are located on top of a concrete pad within a building. The condition of the underground holding tank is unknown.

Surface Water: The potential for release to surface water is low due to the treatment process involved in the unit and release of treated effluent to the sanitary sewer system.

Air: The potential for release to air is low due to the closed nature of the system and the wastes involved.

Subsurface Gas: There is no potential for generation of subsurface gas due to the design characteristics of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

16. UNIT NAME: Drum Storage Area behind Building 3064

Unit Description: This unit consists of containerized wastewater treatment sludge that is stored in 55-gallon drums on wooden pallets prior to removal to the Central Storage Facility (Unit 47) (Ref. 20).

Date of Start-Up: Assumed to be 1979 (Ref. 20).

Date of Closure: The unit is currently active.

Waste Managed: The unit handles containerized wastewater treatment sludge from the metal plating treatment line (Ref. 20).

Release Controls: The drums are elevated from the ground with wooden pallets. There is no secondary containment (Ref. 20).

Release History: There was no visible sign of release during the VSI.

UNIT 16. (Continued)

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is low due to the apparent good condition of the drums and the solidified nature of the waste.

Surface Water: The potential for release to surface water is low due to the containerization of wastes and the unit's distance from any local surface drainage.

Air: The potential for release to air is low due to the nature of the wastes and containerization of the wastes.

Subsurface Gas: There is no potential for the generation of subsurface gas due to the nature of the wastes and the design of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

17. UNIT NAME: Battery Shop Dump - Building 36 (Ref. 3, p.2-1)

Unit Description: This unit consisted of a hillside north of the Battery Shop, Building 36. Spent battery acid and waste oil from forklift servicing was disposed of by allowing it to flow down the hill and into Lake Greenwood (Ref. 20).

Date of Start-Up: 1942.

Date of Closure: A sump was installed in 1980 to take the place of open dumping of acid (Ref. 3).

Waste Managed: The wastes disposed of in the unit were spent battery acid containing lead and sulfates and waste oil and oily water from forklift servicing within Building 36.

Release Controls: The unit was an open hillside with no containment or release control provision.

Release History: Surface drainage flows down the hill and into Lake Greenwood (the facility's drinking supply reservoir). Prior to 1975, acid and waste oil generated during forklift servicing were allowed to flow down the hillside and into Lake Greenwood (Ref. 3, p.6-45). The NACIP study has assessed this area and determined that chemical analysis of the soils at the unit and lake water do not exhibit significant levels of lead (Ref. 3, p.2-1).

UNIT 17. (Continued)

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater in the past was high due to open dumping of liquid waste on a hillside. However, the NACIP study reports that no significant levels of lead (i.e., associated with battery acid) have been found in the soils of the unit. This conclusion was not supported by field and laboratory data.

Surface Water: The potential for release to surface water in the past was high due to the open dumping of liquid wastes on a hillside whose runoff flows into Lake Greenwood. However, the NACIP study reports that no significant levels of lead have been found in the lake water.

Air: The potential for release to air in the past was low due to the nature of the wastes disposed.

Subsurface Gas: The potential for generation of subsurface gas is low due to the open nature of the unit and the wastes managed.

Suggested Further Action: Soils should be sampled on the hillside to verify the conclusions of the NACIP report.

18. UNIT NAME: Acid Neutralization Pit - Building 36 (Ref. 10, p.7)

Unit Description: The acid neutralization pit is a below-grade epoxy coated concrete sump outside of the Battery Shop. The unit receives spent sulfuric acid from spent truck batteries. The unit is connected to the sanitary sewer by a manually operated valve (Ref. 10, p.7). Lime is added manually to increase ph, there are no pH monitoring devices on the unit.

Date of Start-Up: Assumed to be 1980 when disposal of acid down hillside ceased (Ref. 20).

Date of Closure: The unit is currently active.

Waste Managed: Spent battery acid is manually poured into the unit by opening the fiberglass cover and pouring directly into the sump.

Release Controls: The unit is epoxy coated and release to the sewer system is manually controlled. pH monitoring is done manually after manual addition of lime. Prior to 1982 the pit was constructed of concrete only. A plastic liner was added to keep the acidic solution from eroding the concrete.

Release History: Unknown.

UNIT 18. (Continued)

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is low due to the apparent good condition of the unit.

Surface Water: The potential for release to surface water is low due to treatment of the waste and manual feed to the sanitary sewer system after treatment.

Air: The potential for release to air is low due to the nature of the unit.

Subsurface Gas: The potential for generation of subsurface gas is low due to the open design of the unit.

Suggested Further Action: The facility should consider installing an automatic pH monitor at the unit.

*19. UNIT NAME: PCB Burial Area - Pole Yard (Ref. 3, p.2-1)

Unit Description: This unit is a burial site for three capacitors.

Date of Start-Up: 1977.

Date of Closure: 1977 (one time event).

Waste Managed: Three sealed capacitors containing PCB's were buried in this unit.

Release Controls: NWSC reports that the three capacitors were "hermetically" sealed prior to burial. The state of Indiana indicated that NWSC did not have to remove the capacitors if buried prior to February 19, 1978 (Ref. 3, p.2-1).

Release History: Unknown.

UNIT 19. (Continued)

Conclusions: This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.

Suggested Further Action: Obtain information on the construction and design of the unit, volume of wastes managed, and history of release.

20. UNIT NAME: Roads and Grounds Dump Area

Unit Description: This unit is a melange of material deposited at the base of the hill behind Building 2801 (Ref. 20). The area is heavily vegetated (young trees, brush) with a small intermittent stream at the base of the hill.

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Construction rubble and pesticide residues were thought to have been dumped onto the hillside (Ref. 20).

Release Controls: The area was an open hillside with a small intermittent stream at the base of the slope.

Release History: There was no visual evidence of former dumping during the VSI.

Conclusions:

Soil/Groundwater: The potential for release to soil/groundwater is high due to the reported disposal of liquid pesticide wastes on open ground.

Surface Water: The potential for release to surface water is high due to the disposal of wastes onto an open hillside whose run-off flows into an intermittent stream.

Air: The potential for release to air is low due to the inactivity of the unit an the nature of the wastes disposed of in the unit.

Subsurface Gas: The potential for the generation of subsurface gas is low due to the open nature of the unit.

Suggested Further Action:

1. Soils in the dump area should be sampled to determine extent of pesticide contamination due to past practices.

2. Sediment in the nearby stream should be sampled to determine extent of pesticide contami- nation due to past practices.

21. UNIT NAME: PCP Dip Tank

Unit Description: This unit was located near Building 56. It was used for dipping untreated wood into pentacholorophenol (PCP) (wood preservative). The area is presently occupied by a dirt access road and electric vehicle storage (Ref. 20).

Date of Start-Up: 1950.

Date of Closure: The tank was removed in 1965.

Waste Managed: Spent pentachlorophenol (PCP) was generated from wood preservation.

Release Controls: Unknown.

Release History: NWSC reported that the tank was leaking, but the NACIP Report states that there was no evidence of any release (Ref. 3, p.2-3).

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater from this unit is unknown. The NACIP study reports no indication of release from the unit. This conclusion was not supported by field or laboratory data.

Surface Water: The potential for release to surface water from this unit is unknown. The location of the unit overlooks a steep slope which slopes toward Lake Greenwood.

Air: The potential for past release to air from this unit is unknown due to lack of information on the unit. The unit has been removed and there is no present potential for air release.

Subsurface Gas: The potential for generation of subsurface gas from this unit is unknown due to lack of information on the unit's structure.

Suggested Further Action: Soils should be sampled in the former location of the unit to verify the conclusions of the NACIP report.

22. UNIT NAME: Building 126 Sump (Ref. 3, p.6--3)

Unit Description: This unit is a below-grade concrete sump that receives rinse waters from production rooms in Building 126 via individual drains and a central connector. This rinse water is generated from the washing of grit screens and empty paint barrels (Ref. 20). During the VSI, cracks were observed in the tank, and the retaining wall had deteriorated.

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: The unit received rinse water containing phosphorous, manganese, and paint residues (Ref. 20).

Release Controls: The unit discharges directly to the sanitary sewer after solids settle to the bottom. Solids are removed and taken to the CSF (Unit 46).

Release History: Unknown.

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is moderate due to the relatively poor visual appearance of the sump.

Surface Water: The potential for release to surface water is low; the unit discharges to the sanitary sewer system.

Air: The potential for release to air is low due to the dilute nature of the wastes.

Subsurface Gas: The potential for generation of subsurface gas is low due to the nature of the wastes managed and the open design of the unit.

Suggested Further Action: Soil samples should be taken near the walls of the sump to determine if any contamination has occurred due to the cracks in the sump.

*23. UNIT NAME: Dust Collectors - Building 126 (Ref. 3, p.6-3)

Unit Description: This unit collected explosive dust produced in Building 126. The unit used a wet vacuum pump. The collectors were emptied periodically and taken to the Ammunition Burning Grounds (Unit 79) (Ref. 3, p.6-3).

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: The unit collected explosive dust that was trapped using water vapor.

Release Controls: Unknown.

Release History: Unknown.

UNIT 23. (Continued)

Conclusions:	This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.
Suggested Further Action:	Obtain information on the age, design, and operation of this unit and on the disposition of any wastewater.

24. UNIT NAME: Scrap Storage Area Behind Building 126

Unit Description: This unit consists of a concrete pad with metal canopy. It is used for temporary storage of waste starter mix, fuel oil, and explosive contaminated metal parts. The wastes were observed to be in small containers or jugs during the VSI.

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: Various scrap products and salvageable parts are placed on the pad for disposal or renovation. The wastes include waste starter mix, fuel oil, explosive contaminated metal parts, and paint residues. During the VSI, three drums of unlabeled wastes (in good condition), three waste paint cans, and a 15-gallon above-ground fuel oil tank were observed.

Release Controls: The unit consists of a concrete pad protected by a metal overhang. There is no perimeter containment.

Release History: Unknown.

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is low due to the containerization of wastes and release controls employed at the unit.

Surface Water: The potential for release to surface water is low due to the containerization of wastes and the unit's distance from any local surface drainage.

Air: The potential for release to air is low due to the containerization of wastes.

Subsurface Gas: There is no potential for the generation of subsurface gas due to the design of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

*25. UNIT NAME: Red Phosphorous Building Sump - Building 1886 (Ref. 3, p.6-3)

Unit Description: This unit is located between the Chemical Storage Building 2696 and the Ready Magazine, Building 135. In the event of a fire, all wastewater can be collected in this sump.

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Red phosphorous contaminated wastewater.

Release Controls: A six-inch berm surrounds the sump and building.

Release History: Unknown.

UNIT 25. (Continued)

Conclusions: This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.

Suggested Further Action: Obtain information on the operation, period/frequency of use, and integrity of the unit.

26. UNIT NAME: Building 133 Sump (Ref. 3, p.6-8)

Unit Description: This sump receives wastewater from the red phosphorous candle pressing house (Ref. 20). The operation uses red phosphorous, manganese dioxide, magnesium, zinc oxide, and linseed oil within a totally wet operation. The sump consists of three separate concrete chambers that are approximately 6 ft. (l) x 2 ft. (w) x 3 ft. (d).

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: Rinsate water contaminated with red phosphorous is allowed to settle in the sumps prior to pumping the supernatant into the Sanitary Sewer System.

Release Controls: Accumulated sludge is hauled to the Sludge Dewatering Units (Unit 80) at the ABG (Unit 79).

Release History: Unknown.

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is low due to the apparent good condition of the concrete sumps.

Surface Water: The potential for release to surface water is low because rinse water is allowed to settle prior to discharge to the Sanitary Sewer System.

Air: The potential for release to air is low due to the nature of the wastes.

Subsurface Gas: The potential for generation of subsurface gas is low due to the open design of the unit and the nature of the wastes handled.

Suggested Further Action: No further action is suggested for this unit at this time.

27. UNIT NAME: Railroad Maintenance Shop Wash Area - Building 7 (Ref. 3, p.6-45)

Unit Description: The Railroad Equipment Shop is used for maintenance of locomotives. Locomotives are washed with a water-soap-diesel fuel mixture which drains into two long wash sumps that drain into an Oil/Water Separator (Unit 28) outside the building. Diesel fuel for the wash operations is stored in steel drums over a drip rack that drains into the wash sumps.

Date of Start-Up: 1942.

Date of Closure: This unit is currently active.

Waste Managed: Wastes generated are diesel/soap rinse waters and waste oil.

Release Controls: An Oil/Water Separator (Unit 28) was installed at this unit in 1972.

Release History: Prior to 1972, the oily wastewater flowed into Lake Greenwood via several ditches. During the VSI, it was observed that the Oil/Water Separator was not working. All waste liquids are currently discharged to the Sanitary Sewer.

UNIT 27. (Continued)

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater from this unit is low due to inside operations over a concrete floor.

Surface Water: The potential for release to surface water is low because the unit drains to the outside Oil/Water Separator and the water is discharged to the sanitary sewer system.

Air: The potential for release to air is low due to the dilute nature of the wastes.

Subsurface Gas: The potential for generation of subsurface gas is low due to the nature of the wastes and the open design of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

28. UNIT NAME: Railroad Maintenance Shop Oil/Water Separator

Unit Description: This unit is a large below-grade concrete sump outside of Building 7. The unit was designed to skim oil from rinse waters but, according to an NWSC employee, it has been inoperative and periodically overflows sending waste oil and rinse waters into the Sanitary Sewer System (Ref. 20).

Date of Start-Up: Assumed to be 1942 (Ref. 20).

Date of Closure: The unit is currently in use but it is not operative.

Waste Managed: The unit receives rinse waters consisting of soap, water, and diesel fuel from the locomotive wash area.

Release Controls: There are no release controls other than sewer drains on either side of the sump in case of overflow.

Release History: The unit is reported to periodically overflow and send waste oil and rinse waters into the Sanitary Sewer System.

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is high due to the unit's overflow and its questionable integrity.

Surface Water: The potential for release to surface water is high due to the periodic overflows and release of untreated/uncollected oils/solvents into the Sanitary Sewer.

Air: The potential for release to air is low due to the nature of the units.

Subsurface Gas: The potential for generation of subsurface gas is low due to the nature of the wastes and open design of the unit.

Suggested Further Action: The facility should repair the Oil/Water Separator pretreatment unit. There are no provisions at the Wastewater Treatment Plant to treat oily wastes.

29. UNIT NAME: Auto Maintenance Shop - Building 1820 (Ref. 3, p.6-46)

Unit Description: Automotive repairs are performed in this building. The unit consists of several sumps which collect waste oil, wastewater, and several open top solvent cleaning tanks. Three drums were observed outside of the shop which were in poor condition (rusted and dented), these drums contained lube oil.

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: Waste oil and rinse waters are allowed to drain via floor drains into an outside Oil/Water Separator (Unit 32) (Ref. 20). Waste solvent is containerized and taken to the CSF (Unit 47). One of the solvent tanks called the "Parts Boiler" produces an alkaline sludge that is removed to one of the used oil tanks (Ref. 20).

Release Controls: The solvent tanks have no secondary containment. Floor drains in the sumps and floors drain to the Oil/Water Separator (Unit 32).

Release History: Noticeable oil spills and solvent contaminated rags were noted during the VSI.

UNIT 29. (Continued)

Conclusions: **Soil/Groundwater: The potential for release to soil/groundwater is low due to the unit's indoor setting over a concrete floor.**

Surface Water: The potential for release to surface water is low due to the unit's indoor setting and the collection of any rinse waters in an Oil/Water Separator.

Air: The potential for release to air is moderate from the solvent wash tanks due to their open-top design.

Subsurface Gas: There is no potential for generation of subsurface gas due to the nature of the wastes and the open nature of the sumps and tanks.

Suggested Further Action: **No further action is suggested for this unit at this time.**

30. UNIT NAME: Heavy Equipment Maintenance Shop - Building 1818

Unit Description: Heavy equipment repairs are performed in this building. The unit consists of several sumps that collect waste oil and several open top solvent cleaning tanks.

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: Waste oil and rinse waters are allowed to drain into an outside Oil/Water Separator (Unit 32) via floor drains (Ref. 20). Waste solvent is containerized and taken to the CSF (Unit 47).

Release Controls: The solvent tanks have no secondary containment. Floor drains route flow into the Oil/Water Separator.

Release History: Noticeable oil spills and solvent contaminated rags were noted during the VSI.

Conclusions: <u>Soil/Groundwater</u>: The potential for release to soil/groundwater is low due to the unit's indoor setting on a concrete floor.

<u>Surface Water</u>: The potential for release to surface water is low due to the unit's indoor setting and the collection of any rinse waters in an Oil/Water Separator.

<u>Air</u>: The potential for release to air is moderate from the solvent wash tanks due to their open-top design.

<u>Subsurface Gas</u>: There is no potential for generation of subsurface gas due to the nature of the wastes and the open nature of the sumps and tanks.

Suggested Further Action: No further action is suggested for this unit at this time.

31. UNIT NAME: Truck Wash Area at the Heavy Equipment Maintenance Building

Unit Description: This unit consists of two indoor concrete wash racks for trucks and heavy equipment. Rinse waters and any waste oil drain into two drip tracks that drain into the Oil/Water Separator (Unit 32).

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: Rinse waters are generated from truck wash-downs.

Release Controls: The unit has sloped concrete floors that drain to two drip tracks.

Release History: Unknown.

UNIT 31. (Continued)

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is low due to the unit's release controls.

Surface Water: The potential for release to surface water is low because the unit drains into the Oil/Water Separator.

Air: The potential for release to air is low due to the dilute nature of the wastes handled.

Subsurface Gas: The potential for generation of subsurface gas is low due to the open nature of the unit and dilute nature of the wastes.

Suggested Further Action: No further action is suggested for this unit at this time.

32. UNIT NAME: Oil/Water Separator at the Heavy Equipment Maintenance Building

Unit Description: This unit is a below-grade sump outside of Building 1820 that receives rinse waters containing oil/degreasers from the Auto and Heavy Equipment Maintenance Buildings. A thin conveyor belt skims oil and deposits it in a separate adjacent concrete sump where it can be pumped out and into a waste oil storage tank.

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: Oil and degreaser contaminated rinse water is skimmed in the unit. Waste oil is collected in a separate adjacent sump and the remaining water is discharged to the Sanitary Sewer System.

Release Controls: The unit has a removable closed top and overflow valve into the Sanitary Sewer System.

Release History: Unknown.

Conclusions:

<u>Soil/Groundwater</u>: The potential for release to soil/groundwater is low due to the unit's release controls and the apparent good condition of the unit.

<u>Surface Water</u>: The potential for release to surface water is low due to the apparent good working condition of the oil skimmer and subsequent discharge to the Sanitary Sewer System.

<u>Air</u>: The potential for release to air is low due to the dilute nature of the wastes.

<u>Subsurface Gas</u>: The potential for generation of subsurface gas is low due to the dilute nature of the wastes.

Suggested Further Action: No further action is suggested for this unit at this time.

33. <u>UNIT NAME</u>: Outside Truck Wash Rack adjacent to Building 1818

<u>Unit Description</u>: This unit consists of a truck wash hose and a raised wooden slat platform. Trucks are allowed to wash down on the rack with rinse waters going through the slats and down the hill into an intermittent stream.

<u>Date of Start-Up</u>: Unknown.

<u>Date of Closure</u>: The unit is currently active.

<u>Waste Managed</u>: Rinse waters from heavy equipment and truck washings are generated and flow through the raised platform and down the hill.

<u>Release Controls</u>: There are no release controls associated with the unit.

<u>Release History</u>: Due to the unit's design, continuous release of rinse waters to the ground beneath the unit occurs during washing.

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is high due to the unit's construction.

Surface Water: The potential for release to surface water is high because the unit's effluent flows directly into an intermittent stream.

Air: The potential for release to air is low due to the dilute nature of the wastes.

Subsurface Gas: The potential for generation of subsurface gas is low due to the dilute nature of the wastes.

Suggested Further Action:

1. Provisions should be made to collect rinse waters and treat these wastes at the sewage plant.
2. Soils should be sampled underneath the platform and in the drainage ditch that flows down the hillside.

34. UNIT NAME: Roll-Off Boxes Outside Building 1820

Unit Description: These units are typical metal roll-off boxes containing scrap cardboard,wood, and general garbage that is hauled to the Sanitary Landfill (Unit 86). These units are common throughout the site at each building that has any type of ongoing activity.

Date of Start-Up: Unknown.

Date of Closure: Numerous roll-off boxes are in use throughout the site.

Waste Managed: Scrap cardboard, wood, and general garbage is placed in the unit until disposal in the Sanitary Landfill.

Release Controls: The units are located on the paved areas behind each building.

Release History: Unknown.

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is low due to the nature of the wastes handled.

Surface Water: The potential for release to surface water is low due to the nature of the wastes handled.

Air: The potential for air release is low due to the nature of the wastes handled and the short storage periods.

Subsurface Gas: The potential for generation of subsurface gas is low due to the above-ground design of the units.

Suggested Further Action: No further action is suggested for this unit at this time.

35. UNIT NAME: CONEX Hazardous Waste Transfer Containers behind Building 820

Unit Description: These units are yellow painted steel transfer vaults in which 4 drums of waste can be placed and transferred to a storage area. There are numerous CONEX containers on site, one of which was behind Building 1820.

Date of Start-Up: Unknown.

Date of Closure: Numerous CONEX containers are in use throughout the site.

Waste Managed: Containerized hazardous waste is temporarily stored in the vaults for transfer between storage areas. The vaults are then moved by forklift and loaders.

Release Controls: The units serve as a release control for containerized wastes during transfer. The units are located on paved areas behind production buildings where containerized waste is generated.

Release History: Unknown.

UNIT 35. (Continued)

Conclusions:	<u>Soil/Groundwater</u>: **The potential for release to soil/groundwater is low due to containerization of wastes within the unit.**
	<u>Surface Water</u>: **The potential for release to surface water is low due to containerization of waste within the unit.**
	<u>Air</u>: **The potential for release to air is low due to containerization of wastes within the unit.**
	<u>Subsurface Gas</u>: **There is no potential for the generation of subsurface gas due to the design characteristics of the unit.**
Suggested Further Action:	**No further action is suggested for this unit at this time.**

36 UNIT NAME: Oil Pan Wash Out/Disposal Rack Adjacent to Building 1820

Unit Description: This unit consists of a metal drip pan that gravity feeds a pipe which drains into an underground waste oil storage tank. The pan is erected on wooden posts and a dissipated wooden overhang.

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: Waste oil from various drip pans and gallon jugs are emptied and washed in the metal drip pan.

Release Controls: There are no release controls employed at the unit.

Release History: The ground beneath the unit is covered with oil stains with remnants of oil encrusted grass at the foot of the posts.

Conclusions:

Soil/Groundwater: The potential for release to soil/groundwater is high due to spillage of waste oil onto the ground.

Surface Water: The potential for release to surface water is moderate due to possible run-off from the affected soils into an intermittent stream at the base of the hill.

Air: The potential for release to air is low due to the nature of the waste.

Subsurface Gas: The potential for generation of subsurface gas is low due to the open nature of the unit.

Suggested Further Action:

1. **Soil which shows obvious signs of soil contamination should be removed.**

2. **Soil sampling should be performed after removal of visually contaminated soil to verify that there is no further contamination.**

3. **The facility should take steps to ensure no future oil spills (i.e., installation of a containment pad and larger drip pan).**

37. UNIT NAME: Underground Waste Oil Storage Tank -- Building 1818

Unit Description: This unit is a single shell steel storage tank that has a capacity of 500 gallons. It receives waste oil from the Oil Pan Wash Out (Unit 36) and oil from the Auto Maintenance Shops (Unit 29).

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: The underground storage tank is used for storage of waste oil prior to transfer to the storage tank in Building 2801 or use as boiler feed.

Release Controls: The unit does not have a leak detection system.

Release History: Severe erosion of the hillside near the unit had fully exposed its vent pipe and part of the tank (Ref. 20).

Conclusions: Soil/Groundwater: There is a high potential for release to soil/groundwater dependent on the age of the tank and the fact that there is no leak detection system.

Surface Water: The potential for release to surface water is low due to the unit's construction.

Air: The potential for release to air is low due to the design of the unit

Subsurface Gas: The potential for generation of subsurface gas is moderate dependent on the integrity of the tank.

Suggested Further Action: The integrity of the unit should be inspected.

38. UNIT NAME: Underground Waste Oil Storage Tank -- Building 1820

Unit Description: This unit is a single shell steel storage tank that has a capacity of 500 gallons. It receives waste oil from the Heavy Equipment Maintenance Shop (Unit 30) and the Oil/Water Separator (Unit 32).

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: The storage tank is used to store waste oils until transfer to Building 2801 or use as boiler feed.

Release Controls: The unit does not have a leak detection system.

Release History: Unknown.

UNIT 38. (Continued)

Conclusions:	**<u>Soil/Groundwater</u>: There is a high potential for release to soil/groundwater dependent on the age and intergity of the tank and the fact that there is no leak detection system.**
	<u>Surface Water</u>: The potential release to surface water is low due to the units construction.
	<u>Air</u>: The potential for release to air is low due to the design of the unit.
	<u>Subsurface Gas</u>: The potential for generation of subsurface gas is moderate dependent on the integrity of the tanks.
Suggested Further Action:	The integrity of the unit should be inspected.

*39. UNIT NAME: Mechanical Maintenance Shop - Building 56 (Ref. 3, p. 6-47)

Unit Description: Various mechanical repairs are performed in this building. The unit consists of three 15 gallon solvent tanks.

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Waste solvent from degreasing operations is generated and stored in tanks.

Release Controls: Unknown.

Release History: Unknown.

UNIT 39. (Continued)

Conclusions: This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.

Suggested Further Action: Obtain information on the status and condition of the unit, release controls, and release history.

*40. UNIT NAME: 400 Gallon Solvent Storage Tank (Building 56 Paint Shop) (Ref. 3, p. 6-47)

Unit Description: This unit located in the paint shop has a capacity of 400 gallons and is used to store waste solvent from the Mechanical Maintenance Shop.

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Waste solvents (Agitene) are stored in the tank.

Release Controls: Unknown.

Release History: Unknown.

UNIT 40. (Continued)

Conclusions: This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.

Suggested Further Action: Obtain information on the status and condition of the unit, release controls, and release history.

*41. UNIT NAME: Red Phosphorous Mixing Emergency Sump

Unit Description: This unit is a small dead-end concrete sump that is used to collect any water resides in case of a fire or wash-down. The process is normally dry and the sump is rarely used (Ref. 20).

Date of Start-Up: Unknown.

Date of Closure: The unit is put into service when needed

Waste Managed: The unit receives red phosphorous contaminated quench water. If the sump is used, the wastes are pumped out and taken to the ABG (Unit 79).

Release Controls: Unknown.

Release History: Unknown.

UNIT 41. (Continued)

Conclusions:	This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.
Suggested Further Action:	Obtain information on the age, frequency of use and initegrity of the unit.

*42. UNIT NAME: Booster Area - Lead Azide Sump - Buildings 106-107

Unit Description: Facility representatives reported that prior to the installation of the wastewater treatment unit for Buildings 106-107, lead azide contaminated wastewater was collected in concrete sumps for settling prior to discharge to a central unlined pond (Unit 44).

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: The sumps received lead azide contaminated wastewater from production areas within the Building 106-107 complex.

Release Controls: Unknown.

Release History: Unknown.

UNIT 42. (Continued)

Conclusions: This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.

Suggested Further Action: Determine the location of the sumps. Obtain information on design, age, and integrity of the sumps.

*43. UNIT NAME: Wastewater Treatment Unit Building 3074

Unit Description: This unit is the wastewater treatment unit for lead contaminated wastewater from the Booster Area (Buildings. 106-107) (Ref. 20). The water is collected in two, 2000 gallon tanks; polymers and powdered activated carbon are added for precipitation of the lead. The supernatant goes into the sanitary sewer system and the sludge is containerized and stored at the CSF (Unit 47). The VSI team did not have access to the unit because the Army was not working on the inspection day (Ref. 20).

Date of Start-Up: Unknown.

Date of Closure: The Unit is currently active.

Waste Managed: The Unit treats lead azide contaminated wastewater.

Release Controls: Unknown.

Release History: Unknown.

UNIT 43. (Continued)

Conclusions:	This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.
Suggested Further Action:	Determine the current status and condition of the unit. Obtain information on unit operation, release controls, and release history.

44. UNIT NAME: Lead Azide Loading Pond (Ref. 3, pp. 2-3)

Unit Description: This unit was an unlined pond that was 15 ft. X 8 ft. X 3 ft. (Ref. 3, p. 6-10). The pond is located near the Lead Azide Production Building (Buildings 106-107).

Date of Start-Up: 1961

Date of Closure: The unit was taken out of service in 1977.

Waste Managed: Wastewater containing lead salts was discharged into the unit from 1961 to 1977. The pond was periodically pumped out and sediments removed to the Ammunition Burning Grounds (Unit 79) for burning (Ref. 3, p. 7-3).

Release Controls: The pond was closed in 1981; contaminated soil and effluent were removed to an off-site approved landfill (Ref. 13, p. 2-3).

Release History: The area is presently "swampy" with heavy grass and low brush vegetation.

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater was high in the past due to disposed of wastes in an unlined depression. This potential is presently low due to removal of contaminated soil.

Surface Water: The potential for release to surface water in the past was low due to the units low topographical position relative to the surrounding area. This potential remains low presently due to the removal of wastes and the units topographical position.

Air: The potential for air release is low due to the dilute nature of the wastes and inactivity of the unit.

Subsurface Gas: The potential for subsurface gas generation is low due to the open nature of the unit and the wastes handled.

Suggested Further Action: No further action is suggested for this unit at this time.

45. UNIT NAME: Open Storage Area Outside Building 2801

Unit Description: This unit is located across the dirt access road from the Above-ground Waste Oil Storage Tank (Unit 11). It consists of old empty drums, and scrap wood ready for removal to the Salvage Yard (Unit 74) or the Sanitary Landfill (Unit 86) (Ref. 20).

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: Old empty drums and scrap wood are collected on the open ground surface in a temporary storage area.

Release Controls: There are no release controls employed at the unit.

Release History: Unknown.

Conclusions: **Soil/Groundwater: The potential for release to soil/groundwater is low due to the nature of the waste handled.**

Surface Water: The potential for release to surface water is low due to the nature of the waste handled.

Air: The potential for release to air is low due to the nature of the wastes handled.

Subsurface Gas: There is no potential for generation of subsurface gas due to the nature of the wastes and open design of the unit.

Suggested Further Action: **No further action is suggested for this unit at this time.**

*46. UNIT NAME: Cast High Explosives Fill (Building 146) (Ref. 3, p.2-4)

Unit Description: This unit consists of an explosive fill area and pressure washout facility. (Ref. 7, p.6).

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Waste managed included explosive dust (containing lead, cadmium and chromium) and ash; hazardous constituents containing TNT, RDX, HMX had heavy metals; and wastewater containing RDX, TNT and ammonium picrate. (Ref. 3).

Release Controls: In 1978, a wastewater treatment system was installed which collected the wastewater in sumps, which was then transported to the Rockeye area for treatment. (Ref. 3, p. 6-28).

Release History: Prior to 1978, the wastewater was released to a ditch which conveyed the contaminants to a nearby stream. Dust was released via a ventilation system to the furnace. According to the NACIP survey, the potential for soil, groundwater, and surface water release is significant (Ref. 3).

Conclusions: **This unit was not observed during the VSI. However, the release history of this unit indicates that there is a high potential for release to soil and groundwater.**

Suggested Further Action: **Soil sampling should be performed to determine the existence of contamination from the unit.**

47. UNIT NAME: Central Storage Facility (CFS) Ref. 6, p. B-2)

Unit Description: This unit consists of an indoor storage area and an outside storage yard. The storage building is a 40 ft. X 72 ft. metal sided building with an epoxy coated concrete floor. The building is separated into three cells separated by partial cement walls. The outside yard is used for non-liquid container storage and is fenced at its perimeter.

This unit is described as the "single destination for hazardous wastes stored at the NWSC Crane (for periods which may exceed 90 days) prior to being removed to an approved off-site RCRA permitted facility."

Date of Start-Up: 1980 (Ref. 20).

Date of Closure: The unit is currently active.

Wastes Managed: Containerized hazardous wastes including both liquid and solid containerized wastes.

Wastes include: acids/laboratory wastes; oxidizers; caustics; cyanide, stripper solutions and degreasers; solvents; flammables and oil wastes. Wastes are separated by classification.

Release Controls: The indoor storage facility has an epoxy coated collection sump, and 6 inch perimeter curbing. In the event of a spill, drains are individually sealed. The collected liquid is pumped out, and placed in drums for off-site disposal. All solids and flammables are stored outside the storage building.

Release History: There were no visible signs of release during the VSI. A lab pack was open to the air on the east side of the building with apparent salt buildup on one of the containers (Ref. 20).

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is low within the storage building due to the release controls employed. The potential for release to soil/groundwater is low in the storage yard due to the solid nature of the wastes within containers.

Surface Water: The potential for release to surface water is low within the storage building due to the release controls employed. The potential for release to surface water in the storage yard is low due to the containerization of wastes and the distance of the unit from any local surface drainage.

Air: The potential for release to air is low due to the apparent good conditions of the drums.

Subsurface Gas: There is no potential for the generation of subsurface gas due to the design of the unit.

Suggested Further Action: This unit is RCRA regulated. No further action is suggested for this unit at this time under the RCRA Corrective Action Program.

48. UNIT NAME: APE 1236 Incinerators - Building 146 (Ref. 6, p. B-4).

Unit Description: This unit consists of two 87.4 ft^3 oil feed rotary kiln incinerators located on the east edge of Building 146 that are used for the demilitarization of various munitions (Ref. 20). The units seem to be in a state of disrepair and are currently inactive (Ref. 20). Each is enclosed by a 10 ft. cement block wall.

Date of Start-Up: 1967.

Date of Closure: The units are presently inactive but are considered to be in operational condition.

Waste Managed: Waste ammunitions are incinerated in the units. The incineration process produces waste ash, baghouse dust and scrap metal. The metal is recovered and sold. The solids are collected in containers and transferred to the Central Storage Facility (Unit 47).

Release Controls: Each unit has a pollution control system which consists of a cyclone, baghouse, draft fan, and stack (Ref. 6, p. D-28). The baghouse collects waste dust through 96 filter bags made of NOMEX felt (Ref. 6, p. D-31). The dust is collected in a hopper and the baghouse is the last air release control device (Ref. 20). The wet scrubber system is not in use.

Release History: One monitoring well has been installed in the area of the incinerators; it has not been sampled.

Conclusions:

Soil/Groundwater: The unit is located on a cement pad within an enclosed cement block wall. The potential for release to soil/groundwater is low.

Surface Water: The potential for release to surface water is low due to the release controls employed at the unit.

Air: The potential for release to air appears to be high during unit operation due to the apparent poor condition of the air pollution control devices. The wet scrubber system is currently inoperative, and facility representatives noted that the particulate abatement system requires repair.

Subsurface Gas: There is no potential for generation of subsurface gas due to the design of the unit.

Suggested Further Action:

This unit is RCRA regulated. The units should not be operated until the pollution abatement systems are in good working order.

49. UNIT NAME: Prototype Incinerator - Building 146 (Ref. 6, p. B-3, 4).

Unit Description: This prototype incinerator has a 46.1 ft^3 capacity (Ref. 6, p. I-3). It is located between the two 1236 APE Incinerators (Unit 48). The unit is RCRA regulated (Interim Status) (Ref. 6, p. D-27). The unit's air release stack was completely broken off and the unit appeared be in a general state of disrepair (Ref. 20).

Date of Start-Up: 1967.

Date of Closure: The unit is currently inactive. Facility representatives note that it is due for major repair work.

Waste Managed: Small waste ammunitions are incinerated in the unit.

Release Controls: The unit is located over a concrete pad with a 10 ft. block wall on three sides of its perimeter. The unit air release stack was broken off and lying on the ground behind Building. 146. (Ref. 20).

Release History: One monitoring well has been installed in the area of the incinerators. It has not been sampled.

UNIT 49. (Continued)

Conclusions: **Soil/Groundwater: The unit is located on a cement pad within an enclosed cement block wall. The potential for release to soil/groundwater is low.**

Surface Water: The potential for release to surface water is low due to the release controls employed at the unit.

Air: The potential for release to air appear to be high during unit operation due to the apparent poor condition of the air pollution control devices.

Subsurface Gas: There is no potential for generation of subsurface gas due to the design of the unit.

Suggested Further Action: **This unit is RCRA regulated. The unit should not be operated until the pollution abatement systems are in good working order.**

50. UNIT NAME: Defense Reutilization and Marketing Office (DRMO) Hazardous Waste Storage Area (Building 2035)

Unit Description: This unit consists of metal storage racks within a concrete "bunker" building (Building. 2035). Hazardous materials in assorted container sizes are stored in the racks awaiting resale or recycling. If this is not possible, the material is considered to be a hazardous waste and is taken to the CSF (Unit 47) within 90 days of the waste description.

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: All types of hazardous materials that can be considered for resale or reuse. These can include waste stripper materials, out-dated solvents, and non-explosive product that have exceeded their shelf lives (Ref. 20).

Materials observed during the VSI are as follows: barium peroxide, incendiary oil M2, Thermit, and "MICRO" developer.

Release Controls: The unit is contained within a concrete building over a concrete floor.

Release History: Unknown.

Conclusions: <u>Soil/Groundwater</u>: The potential for release to soil/groundwater is low due to the containerization of wastes and location of the unit within an enclosed building.

<u>Surface Water</u>: The potential for release to surface water is low due to the containerization of wastes and location of the unit within an enclosed building.

<u>Air</u>: The potential for release to air is low due to the apparent good condition of the containers stored in the unit.

<u>Subsurface Gas</u>: There is no potential for generation of subsurface gas due to the design of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

51. UNIT NAME: DRMO Storage Lot

Unit Description: This unit consists of a level gravel pad that is approximately 1 acre (Ref. 20). The area is fenced at its perimeter and is located on the ridge overlooking the DRMO Storage Area (Unit 50).

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: PCP coated wood pallets and empty ammunitions cases are stored in bulk on the gravel pad prior to disposed or reuse.

Release Controls: There are no release controls employed at the unit.

Release History: Unknown.

Conclusions:

Soil/Groundwater: The potential for release to soil/groundwater is low due to the nature of the wastes stored.

Surface Water: The potential for release to surface water is low due to the nature of the wastes stored.

Air: The potential for release to air is low due to the nature of the wastes stored.

Subsurface Gas: There is no potential for generation of subsurface gas due to nature of the wastes stored and the open design of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

*52. UNIT NAME: Paint Shop Building 2889 (Ref. 3, p. 6-48)

Unit Description: This unit consists of a storage area for paint waste. Facility representatives noted that there were several paint shops located throughout the facility.

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Paint wastes, spent paint thinner, and acetone are generated and stored in this unit.

Release Controls: Paint wastes are currently collected and disposed of by a chemical service.

Release History: Past practices involved dumping these waste down the hill behind Building 2889.

Conclusions: This unit was not observed during the VSI. However, the past release history indicates a high potential for release to soil and groundwater.

Suggested Further Action: Soil sampling should be performed to determine the existence of contamination from the unit.

*53. UNIT NAME: Load and Fill Area - Buildings 105, 198 and 200 (Ref. 3, p. 2-4)

Unit Description: According to the NACIP survey, this unit encompassed the area including Buildings 105, 198 and 200. (Ref. 3).

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Wastes managed contained heavy metals and explosives, including lead, chromium, ammonium picrate, RDX and HMX.

Release Controls: Unknown.

Release History: The load and fill operations produced particulate releases. This contamination was assumed to migrate to surface waters (Boggs Creek) and percolate to groundwater (Ref. 3, p. 2-4).

Conclusions: This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.

Suggested Further Action: Obtain information on the design and opertion of the unit and additional information on release history.

*54. UNIT NAME: Wastewater Treatment Unit Building 160

Unit Description:	This wastewater treatment unit has a capacity of 14,000 gallons per day. Waste pink water is treated with carbon adsorption. Approximately 30,000 - 40,000 gallons was treated between 1981 and 1985 (Ref. 1). This unit is located in Building 160. The unit contains three carbon columns; two are in operation as the primary and secondary (polishing) columns, while the third column is backwashed. The effluent from this unit is sent to the Sanitary Wastewater Treatment Plant (Unit 55). Backwash water is recycled to the beginning of the plant (Ref. 20).
Date of Start-Up:	1980 (Ref. 1).
Date Closure:	The unit is currently active.
Wastes Managed:	Pink water (TNT contaminated water) is treated at this unit. Waste carbon is generated from the treatment columns. Approximately 46,000 lb/yr (140 drums) of waste carbon is produced from this unit and the carbon columns in Building 3004 (SWMU No. 6). Prior to January 1986, the waste carbon was sent to the burning grounds. It is now sent off-site for disposal.
Release Controls:	Unknown.
Release History:	Unknown.

UNIT 54. (Continued)

Conclusions: This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.

Suggested Further Action: Determine the current status and condition of the unit. Obtain information on release controls and release history.

55. UNIT NAME: Wastewater Treatment Unit - Sewage Plant - Building 3049

Unit Description: The wastewater treatment plant has a capacity of 1.2 MGD, and usually treats 0.35 to 0.4 MGD. The unit treats sanitary and industrial wastes from throughout the facility (Ref. 20). Treatment is as follows: (Ref. 20)

a) grit chamber/comminutor/equalization (two-65,000 gallon chambers);
b) chlorination;
c) hydrosieve;
d) rotating biological contactors (five contactors);
e) flocculation/clarification with alum (above-ground flocculation chambers);
f) sand/anthracite filtration;
g) chlorination (below-ground holding tank;
h) cascade aeration.

The removed solids are sent to an aerobic digestor. Wastewater generated during backwash of the filters is routed to the equalization chambers.

Date of Start-Up: 1978

Date of Closure: This unit is currently active.

55. UNIT NAME: Wastewater Treatment Unit - Sewage Plant - Building 3049 (Continued)

Waste Managed: Approximately 0.3 - 0.4 MGD of liquid wastes are treated. Both sanitary and industrial wastes are treated at the plant within the same treatment line.

Release Controls: All units, with the exception of the biological contactors, are constructed of concrete. The biological contactors are constructed of fiberglass with a concrete base. These units appear to be in good condition.

Following treatment, the effluent is discharged to Boggs Creek.

Release History: Unknown.

Conclusions: <u>Soil/Groundwater</u>: The potential for release to soil/groundwater is low due to the apparent good condition of the concrete tanks and pumping system.

<u>Surface Water</u>: The potential for release to surface water is moderate taking into account all of the industrial effluent that enters the system and is treated with methods used primarily for sanitary sewage.

<u>Air</u>: The potential for release to air is low due to the dilute nature of the wastestream.

<u>Subsurface Gas</u>: The potential for generation of subsurface gas is low due to the design operation of all of the treatment units.

Suggested Further Action: The unit discharges under NPDES Permit No. IN0021539. No further action is suggested for this unit at this time under RCRA corrective action.

56. <u>UNIT NAME</u>: Old Sludge Drying Beds

<u>Unit Description</u>:	This unit consists of three soil based cells separated by 2 ft. concrete walls at the sewage treatment plant. These cells were used for sewage sludge drying prior to land application of the sludge. The unit is no longer in use. The sludge applied was apparently the sludge produced prior to the treatment system that is presently in place.
<u>Date of Start-Up</u>:	Unknown.
<u>Date of Closure</u>:	Unknown.
<u>Waste Managed</u>:	Sludge developed from the sewage treatment plant which potentially certain hazardous constituents from industrial effluent.
<u>Release Controls</u>:	The unit is divided into three cells by 2 ft. concrete walls. The unit has a natural soil base and removable slats in each wall for sludge removal.
<u>Release History</u>:	Unknown.

UNIT 56. (Continued)

Conclusions: <u>Soil/Groundwater</u>: **The potential for release to the soil/groundwater is high due past practices.**

<u>Surface Water</u>: **The potential for release to surface water is high due to the lack of release controls and the presence of a small stream within 100 ft. of the unit.**

<u>Air</u>: **The potential for release to air is low due to the condition of the unit.**

<u>Subsurface Gas</u>: **The potential for generation of subsurface gas is low due to the open nature of the unit.**

Suggested Further Action: Soil sampling should be performed in the area of the drying beds to determine potential for contamination.

57. UNIT NAME: Sewage Sludge Vacuum Truck and Discharge Pad

Unit Description: This unit consists of a discharge pipe that is elevated approximately 10 ft. above a paved surface. Sewage sludge from the aerobic digestor is pumped through a delivery line and into a vacuum truck for subsequent land application.

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: Sewage sludge from the aerobic digestor of the Sewage Treatment Plant.

Release Controls: The discharge hose is located over a paved entry pad.

Release History: Unknown.

UNIT 57. (Continued)

Conclusions: <u>Soil/Groundwater</u>: The potential for release to soil/groundwater is low due to hose to truck delivery and the pavement beneath the delivery hose.

<u>Surface Water</u>: The potential for release to surface water is low due to hose to truck delivery and the pavement beneath the delivery hose.

<u>Air</u>: The potential for release to air is low due to the nature of the waste and the hose to truck delivery.

<u>Subsurface Gas</u>: There is no potential for generation of subsurface gas due to the design of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

58. UNIT NAME: Demolition Range

Unit Description: This covers an area of 40 to 50 acres. Open and underground detonation of waste pyrotechnics and munitions and loaded unsafe munitions. Trenches are dug, the wastes are containerised with a detonation charge, and the trench is filled. Residual material is usually left in place (Ref. 20). The area is barren of vegetation with denuded trees at its perimeter.

Date of Start-Up: 1940's

Date of Closure: The unit is currently active.

Waste Managed: Approximately 4230 gallons per day (273 to 3500 tons per year) of waste pyrotechnics and munitions were managed by this treatment unit from 1981 to 1984. Hazardous constituents identified at this unit are D003, and P009 (Ammonium picrate) (Ref. 7, p. 3). Highly dangerous unsafe explosives are detonated by the Explosive Ordnance Disposal on the north edge of the unit (Ref. 20).

Release Controls: This unit is located on a ridge with surface drainage to both Boggs Creek and Turkey Creek. There are four sedimentation ponds that collect contaminated run-off from the unit.

Monitoring wells have been installed in this area.

Release History: Various metal scraps and other debris were stored on the ground outside of the limits of the Demolition Range during the VSI.

Conclusions:	**Soil/Groundwater: There is a high potential for release to soil/groundwater due to the nature of the waste treatment.**
	Surface Water: There is a high potential for release to surface water (specifically the sedimentation pond) from the unit due to open detonation of wastes and the lack of vegetative cover to control run-off.
	Air: There is a moderate release potential to air during detonation of wastes.
	Subsurface Gas: The potential for generation of subsurface gas is low due to the nature of the waste.
Suggested Further Action:	**Continued assessment of groundwater quality should be performed to determine the extent of contamination.**

59. UNIT NAME: Waste Explosive Storage Area at the Demolition Range

Unit Description: This unit consists of metal lockers that rest on concrete pads within a fenced area. Waste explosives are kept in the lockers until prepared for detonation. The unit is located on the west edge of the Demolition Range.

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: Small munitions, unsafe loaded munitions and waste pyrotechnics are stored prior to detonation.

Release Controls: The wastes are stored in containers within metal lockers over a concrete pad.

Release History: Unknown.

Conclusions: <u>Soil/Groundwater</u>: The potential for release to soil/groundwater is low due to the release control employed at the unit.

<u>Surface Water</u>: The potential for release to surface waste is low due to the release controls employed at the unit.

<u>Air</u>: The potential for release to air is low due to the containerization of waste within sealed lockers.

<u>Subsurface Gas</u>: There is no potential for generation of subsurface gas due to the design of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

60. UNIT NAME: Pest Control Area Building 2189 (Ref. 2, p. 3)

Unit Description: This unit consists of a concrete sumps and waste pad used for washing pesticide spray tanks. Prior to installation of the sump, pesticide rinse water was sprayed into the trees behind the building (Ref. 20).

Date of Start-Up: 1977 (Ref. 3)

Date of Closure: The unit is currently active

Waste Managed: Pesticide rinse waters are generated and presently discharged to the sanitary sewer after collection in the sump. Pesticides used in the past at NWSC include: 2,4,-D; 2, 4, 5-T; MH-30; Talvon; DDT; Lindane and Chlordane (Ref. 20).

Release Controls: The unit has a 3 inch concrete curb around the wash pad. Four monitoring wells were installed downgradient of Building 2189 in the summer of 1986.

Release History: Pesticide accumulation in the parking lot of Building 2189 and the surrounding soil is considered possible due to the lack of controlled drainage prior to 1977. Prior to 1977, pesticide rinse water was washed down the hillside; containers containing pesticides were reused, punched, and buried in a landfill. This accumulation presents a potential for releases to surface water via runoff and groundwater contamination via percolation. (Ref. 3).

Conclusions:	<u>Soil/Groundwater</u>: The release potential to soil/groundwater in the area behind the unit is high due to past disposal practices. New practices with the collection sumps indicate a low potential for release.
	<u>Surface Water</u>: the release potential to surface water is low due to the discharge of wastes to the sanitary sewer system.
	<u>Air</u>: The release potential to air is low due to the dilute nature or the wastes.
	<u>Subsurface Gas</u>: The release potential for generation of subsurface gas is low due to the open nature of the unit.
Suggested Further Action:	Continued assessment of groundwater quality should be performed to determine the extent of contamination.

61. UNIT NAME: Former Site of Waste Oil Underground Storage Tank near the Pest Control Area

Unit Description: This area is presently graded with sparse vegetation and three monitoring wells in place (Ref. 20). A large, old fuel oil tank and several drums filled with fuel oil sludge (Unit 62) are located adjacent to this area. According to facility representatives the tank was in "fair" shape when it was removed.

Date of Start-Up: The tank was installed in the early 1970's.

Date of Closure: The tank was removed in 1983 (Ref. 20).

Waste Managed: The unit stored waste oil and degreasers that were contaminated with PCBs.

Eight drums containing waste fuel oil sludge collected from the underground storage tank are now located in this area. These drums are to be shipped off-site for disposal. Another diesel fuel storage tank, which was previously underground in another location, is now resting above ground north of the drums. The tank is covered with rust and is reported empty. Facility representatives report that the tank was cleaned in 1986 and is now the property of DRMO (Ref. 20).

Release Controls: The unit was a single steel tank that rested on a thin coal layer. The unit did not have a leak detection system. Three monitoring wells were installed in this area in the summer of 1986. Sandy Clay was backfilled into the area after the tank was removed (Ref. 20).

Release History: Soil borings have shown elevated levels of heavy metals (Ref. 13, p. 26). Trans-1, 2, DCE and TCE were detected in the monitoring wells (Ref. 13, p. 26). Facility representatives stated that contamination was probably the result of spills during waste transfer and not tank leakage (Ref. 20).

Conclusions:	<u>Soil/Groundwater</u>: There is documented release to soil/groundwater from this unit.
	<u>Surface Water</u>: The potential for release to surface water is low due to removal of the tank and the distance of the unit from any local surface drainage.
	<u>Air</u>: The potential for close to air was low due to the design of the unit and the nature of the wastes handled.
	<u>Subsurface Gas</u>: The potential for generation of subsurface gas is low due to the nature of the wastes handled.
Suggested Further Action:	Continued assessment of groundwater quality should be performed to determine the extent of contamination.

62. UNIT NAME: Drum Storage Area Adjacent to SWMU # 61

Unit Description: This unit consists of eight drums that were filled with fuel oil sludge from tank cleaning and were stored adjacent to SWMU # 61 (Ref. 20).

Date of Start-Up: Unknown.

Date of Closure: The drums are being stored temporarily until off-site disposal (Ref. 20).

Waste Managed: Containerized fuel oil sludge was stored in 55 gallon steel drums.

Release Controls: The unit employed no release controls.

Release History: There was no visible sign of release from any of the drums during the VSI.

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is low due to the apparent good condition of the drums.

Surface Water: The potential for release to surface water is low due to the apparent good condition of the drums.

Air: The potential for release to air is low due to the nature of the wastes and the apparent good condition of the drums.

Subsurface Gas: There is no potential for generation of subsurface gas due to the design of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

63. UNIT NAME: Rifle Range

Unit Description: This ten-acre unit consists of an open field with three burning pits. Each pit has several burning pans in which "Yellow D" explosive and other explosive contaminated material is burned. Prior to July 1986, burning was conducted on open ground (Ref. 20). This unit has also been used for "bomb cook-off" tests (Ref. 3, p.6-37).

Date of Start-Up: 1940's.

Date of Closure: The unit is currently active.

Waste Managed: "Yellow D" explosive is burned in bulk in metal pans that are approximately 7 ft. (L) X 5 ft. (W) X 1 ft. (D). Ash residues are containerized and taken to the CSF for storage (Ref. 20).

Hazardous constituents identified are D003 and P009. From 1981 to 1984, 7 to 240 tons of wastes per year were managed at this unit.

Release Controls: The burning pans were installed in July 1986 to prevent soil contamination with Yellow D. The burn areas are lined with four layers of plastic and clay.

Release History: Soil around the pans was yellow in color and there was significant ash accumulation within each pit (Ref. 20). There are groundwater monitoring wells for the unit but this data was not available for review.

63. UNIT (Continued)

Conclusions: <u>Soil/Groundwater</u>: The potential for release to soil/groundwater is high due to past practices of open burning on the soil.

<u>Surface Water</u>: The potential for release to surface water is high due to the fact that run-off from the area flows into a small stream at the base of the unit.

<u>Air</u>: The potential for release to air is high during burning but is generally low when burning is not taking place.

<u>Subsurface Gas</u>: The potential for generation of subsurface gas is low due to the open nature of the unit.

Suggested Further Action:

1. Continued assessment of groundwater quality should be performed to determine the extent of contamination.
2. Surface water/sediment sampling of the stream downgradient of the unit should be conducted to determine the extent of contamination (if any).

64. UNIT NAME: Sedimentation Pond # 1

Unit Description: This unit is an unlined one acre engineered pond designed to capture possibly contaminated run off from the Demolition Range (Unit 58). Its effluent exits the facility at NPDES outfall 001. The unit is one of four collection ponds for the Demolition Range. The other three are located in Section 7.

Date of Start-Up: 1975.

Date of Closure: The unit is currently active.

Waste Managed: The unit collects surface run-off contaminated with residual explosives from the Demolition Range.

Release Controls: The pond is unlined, but serves to settle out solids in run-off prior to NPDES Discharge.

Release History: Unknown.

UNIT 64. (Continued)

Conclusions:

Soil/Groundwater: The potential for release to soil/groundwater is moderate due to the nature of the wastestream.

Surface Water: The potential for release to surface water is moderate due to the nature of the wastestream.

Air: The potential for release to air is low due to the dilute nature of the wastestream.

Subsurface Gas: The potential for generation of subsurface gas is low due to the open nature of the unit and the dilute nature of the wastestream.

Suggested Further Action:

1. Surface water sampling should be performed to determine levels of explosives and other contaminants from wastes treated at the Demolition Range.

2. Sediment samples should be taken to determine levels of explosives and other contaminant from wastes treated at the Demolition Range.

65. UNIT NAME: Mine Fill A (Ref. 3, p. 204)

Unit Description: This unit consists of collection sumps and a carbon adsorption wastewater treatment unit for treatment of explosive contaminated rinse waters. "Shock charges", which use very little water, are presently being loaded at the unit (Ref. 20). The VSI team was only able to access the outside of the building.

Date of Start-Up: 1942.

Date of Closure: The unit is presently only producing small amounts of materials.

Waste Managed: Waste rinsewater contaminated with TNT, RDX, HMX and titanium tetrachloride is collected and treated via carbon adsorption.

Release Controls: Collected sludge is recovered from the sumps and taken to the ABG (Unit 79). A particulate abatement system was installed in the mid 1970's (Ref. 3, p. 6-17).

Release History: Unknown. However, prior to installation of the wastewater treatment system, wastewater was allowed to enter surface drainage. Sediments surrounding the Fill are contaminated with trace explosives due to past particulate release (Ref. 3, p.2-4). Facility representatives noted that the probable source of soil contamination was screen pouring of mine powder.

Conclusions:

Soil/Groundwater: There is documented trace contamination of the soils surrounding the unit due to past practices.

Surface Water: There is high potential for release to surface water due to run-off of contaminated soils into intermittent stream drainage.

Air: The release potential in the past was high due to particulate release. Presently, the potential is low due to pollution controls and a small production volume.

Subsurface Gas: The release potential for generation of subsurface gas is low due to the nature of the wastes.

Suggested Further Action: Further soil sampling should be performed to determine extent of contamination.

66. UNIT NAME: Mine Fill B

Unit Description: This unit consists of collection sumps and a container storage area. The unit no longer is used for mine loading, but is used for munitions renovation including grit blasting and painting (Ref. 20). The VSI team was only able to access the outside of the building.

Date of Start-Up: 1942.

Date of Closure: The unit is currently active.

Waste Managed: The unit formerly managed explosive contaminated wastewater that was allowed to enter surface drainage. Presently grit residues and paint wastes are containerized and stored on wood pallets prior to removal to the CSF (Unit 47) (Ref. 20).

Release Controls: Unlike Mine Fill A, the unit does not have an air pollution control system. However, there is no present explosives operation at the unit (Ref. 20).

Release History: Sediments surrounding the Fill are contaminated with trace explosives due to past particulate release (Ref. 3, p.2-4).

UNIT 66. (Continued)

Conclusions:	Soil/Groundwater: There is documented trace contamination of the soils surrounding the unit. Surface Water: There is high potential for release to surface water due to run-off of contaminated soils into intermittent stream drainage. Air: The release potential in the past was big due to particulate release. Presently the potential is low due to pollution controls and a small production volume. Subsurface Gas: The release potential for generation of subsurface gas is low due to the nature of the wastes.
Suggested Further Action:	Further soil sampling should be performed to determine extent of contamination.

*67. UNIT NAME: Wastewater Treatment Unit - Building 104 (Ref. 3, p. 6-14)

Unit Description: The unit is a carbon adsorption unit (Ref. 20).

Date of Start-Up: 1979.

Date of Closure: This unit is currently active.

Waste Managed: Wastes managed included explosive contaminated wastewater containing wastes from x-ray booths and phosphatizing lines. However, the phosphatizing lines have been discontinued.

Release Controls: Unknown.

Release History: Prior to 1979, the wastewater was discharged into storm drains that flowed into Boggs Creek.

Conclusions: This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding potentials to the various pathways.

Suggested Further Action: Obtain information on unit design and operation, and current condition of the unit.

68. UNIT NAME: Explosive D Wash Areas (Ref. 3, p. 6-28)

Unit Description: This unit consisted of four separate processes.

a) hot water rinse of projectiles and bombs to remove explosive D.

b) cooling the hot water to allow the Explosive D to crystallize out of solution

c) return of residual process water to a sump and eventually to Boggs Creek

These operations had occurred in Buildings 104, 105, 198, and 200. The VSI team was only able to access the outside of Building 104 and observe one of the collection sumps. A cement drain lead into the sump where the waste stream was allowed to settle with discharge to Boggs Creek (Ref. 20).

Date of Start-Up: Unknown.

Date of Closure: The wash out process is no longer in operation (Ref. 20).

Waste Managed: The wastes managed in the unit include wastewater contaminated with Explosive D.

Release Controls: The unit had no release controls.

Release History: Some staining of soil around the cement drain into the sump was noted during the VSI.

Conclusions:

<u>Soil/Groundwater</u>: The release potential in the past to soil/groundwater was high due to waste management practices. Presently the potential is low due to cessation of the process.

<u>Surface Water</u>: The release potential in the past to surface water was high due to waste management practices in the past. Presently the potential is low due to cessation of the process.

<u>Air</u>: The potential for air release in the past was moderate due to steam cleaning of waste containing Explosive D. Presently there is no potential for air release.

<u>Subsurface Gas</u>: There is no potential for generation of subsurface gas due to the design of the unit and the nature of the wastestream.

Suggested Further Action: Sediments should be sampled in the intermittent stream south of the wash area.

*69. UNIT NAME: Load and Fill Area Sumps Building 104

Unit Description: These sumps are probably collection sumps for TNT contaminated wastewater (Ref. 20).

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Process rinsewater that is contaminated with explosives.

Release Controls: Unknown.

Release History: Unknown.

Conclusions: This unit was not observed during the VSI. Insufficient information was available to develop conclusion regarding release potentials to the various pathways.

Suggested Further Action: Obtain information on the exact location of the sumps, period of operation, frequency of use, design, and current condition.

*70. UNIT NAME: Steam Out Unit - Building 160 (Ref. 3, p. 6-28)

Unit Description: This unit consists of a steam stripper to melt residual explosives from casings from demiltarization. After the casings are stripped, they are flushed with water. The solid explosive particles are taken to the Demolition Range.

Waste treatment consists of cooling, paper filtration and carbon adsorption. The wastewater is then held in a sump prior to discharge to the sanitary sewer system.

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: The waste managed is described as explosive contaminated wastewater.

Release Controls: Unknown.

Release History: Unknown.

Conclusions: **This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.**

Suggested Further Action: **Obtain information on unit operation, period of operation, release controls, and release history. Determine the current status and condition of the unit.**

71. UNIT NAME: Highway 58 Dump Site A (Ref. 4, p. 64)

Unit Description: This unit is located between Highway 45 and the NWSC Salvage yard on Highway 58. Disposal was apparently conducted along a hillside with an intermittent stream at the base of the hill.

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Unknown.

Release Controls: This area was an unengineered disposal area (Ref. 20).

Release History: The ground on the hillside appeared to be disturbed with pieces of metal, rock, and fallen trees in scattered areas (Ref. 20). There were two monitoring wells in place at the base of the hill. Monitoring data was not available for review.

UNIT 71. (Continued)

Conclusions: Insufficient information was available to develop conclusions regarding release potentials to the various pathways.

Suggested Further Action: Continued assessment of groundwater quality should be performed to determine the extent of contamination (if any).

*72. UNIT NAME: Storage Tanks - Building 104 (Ref. 15)

Unit Description: These storage tanks have a total capacity of 36,000 gallons. They are used to store yellow D wastewater. (Ref. 7, pp. 5-6). This unit was deleted from the RCRA Application because wastes are stored less than 90 days. This unit may be part of the Explosive Wash Area (Unit 68).

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Yellow D wastewater is collected in the tanks.

Release Controls: Unknown.

Release History: Unknown.

Conclusions: This unit was not observed during the VSI. Insufficient information was available to develop conclusion regarding release potentials to the various pathways.

Suggested Further Action: obtain information on the age and integrity of the tanks, release controls, and history of release.

*73. UNIT NAME: Bomb Proof Group

Unit Description: This unit was identified as an open area on a facility section map. No further information was available regarding its purpose.

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Unknown.

Release Controls: Unknown.

Release History: Unknown.

Conclusions:	This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.
Suggested Further Action:	Obtain information on the design, operation, and condition of the unit, period of operation, types of wastes managed, and release history.

74. UNIT NAME: DRMO Salvage Yard

Unit Description: This unit consists of scrap metal parts, and old tires that are separated into open piles according to metal type and ultimate destination. The area is a natural soil pad and is entirely fenced. It is located near Building 2704 (Ref. 20).

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: The unit serves as a storage lot for scrap metals and rubber prior to resale or recycling.

Release Controls: The unit is fenced at its perimeter but there are no other release controls.

Release History: Unknown.

Conclusions: <u>Soil/Groundwater</u>: The potential for release to soil/groundwater is low due to the nature of the wastes handled.

<u>Surface Water</u>: The potential for release to surface water is low due to the nature of the wastes handled.

<u>Air</u>: The potential for release to air is low due to the nature of the wastes handled.

<u>Subsurface Gas</u>: the potential for generation of subsurface gas is low due to the open nature of the unit and the nature of the wastes handled.

Suggested Further Action: No further action is suggested for this unit at this time.

*75. UNIT NAME: Heavy Equipment Storage Area - Building 2189

Unit Description: This unit houses the one ton stake bed truck that transports containerized hazardous wastes across the site (Ref. 20).

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Heavy equipment that is potentially contaminated with various hazardous constituents is stored in this building.

Release Controls: Unknown.

Release History: Unknown.

UNIT 75. (Continued)

Conclusions:	This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.
Suggested Further Action:	Obtain information on the exact uses of the unit, including any decontamination operations, and types of wastes managed.

76. UNIT NAME: Sanitary Sewer System (Ref. B-5)

Unit Description: This unit receives wastewater from most processes at the facility. Receives such wastes as: boiler blowdown, explosive rinse water and chemical plating wastewater. See Unit 55 for an explanation of treatment of sewer influent at the facility.

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: Wastewater from the following units is discharged to the sanitary sewer system:

Unit No.	Unit Name
4/6	Rockeye Loading Area Sumps/Rockeye Loading Area Wastewater Treatment Unit-Building 3004
13/14.	Building 136 Sump/Wastewater Treatment Unit (Lead) - Building 136
15.	Wastewater Treatment Unit - Building 3064
18.	Acid Neutralization Pit - Building 36
22.	Building 126 Sump
25.	Red Phosphorous Building 1886 Sump
26.	Building 133 Sump
27/28.	Railroad Maintenance Shop Wash Area/Oil-Water Separator - Building 7
29.	Auto Maintenance Shop Building 1820
30/32.	Heavy Equipment Maintenance Shop/Oil Water Separator - Building 1818
43.	Wastewater Treatment Unit Building 3074
54.	Wastewater Treatment Unit Building 160
60.	Pest Control Area Building 2189
65.	Mine Fill A
67/69.	Wastewater Treatment Unit/Load and Fill Area Sumps Building 104
70.	Steam Out Unit Building 160
80/81.	Sludge Dewatering Units/Underground Storage Tanks ABG
87.	Sanitary Landfill Leachate Collection Pond
100.	Settling Pond Behind Building 106

76. UNIT NAME: Sanitary Sewer System (Ref. B-5)

Release Controls: Unknown. The route of the sanitary sewer system was not provided.

Release History: The facility is currently attempting to send dye tracers through the sewer system.

Conclusions: Soil/Groundwater: There is a potential for release of waters to soil/groundwater from the sanitary sewer system. The extent of release cannot be verified until completion of the dye tracer study.

Surface Water: There is a potential for release of wastes to surface water. The extent cannot be verified until completion of the dye tracer study.

Air: The potential for release of wastes to air is low due to the nature of the unit.

Subsurface Gas: The potential for generation of subsurface gases is low to moderate due to the nature of the wastes.

Suggested Further Action: Completion of the dye tracer study.

*77. UNIT NAME: Turkey Creek Quarry (Ref. 3, p. 6-58)

Unit Description: This unit consisted of an old stone quarry where garbage was burned and buried. This area is about 1000 ft. south of the H99 bridge over Turkey Creek. During the VSI, facility representatives reported that they were not familiar with this unit (Ref. 20), and that it may be Highway 58 Dump Site A (Unit 71).

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Garbage, not specified.

Release Controls: Unknown.

Release History: Unknown.

UNIT 77. (Continued)

Conclusions: **This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.**

Suggested Further Action: **Obtain information on the operation of this unit including information on the history of wastes managed.**

78. UNIT NAME: Highway 58 Dump Site B (Ref. 4, p. 67)

Unit Description: This disposal unit is located 4 miles south of magazine 871, near bridge 1854. The unit is at the base of a massive sandstone outcrop. There are visibly rusted containers and metal parts at the surface.

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Fifteen crushed and rusted drums were observed in this area during the VSI; the contents are unknown.

Release Controls: The unit was an unengineered disposal area. Seven monitoring wells have been installed in this area.

Release History: Unknown.

Conclusions:	Insufficient information was available to develop conclusions regarding release potentials to the various pathways.
Suggested Further Action:	Continued assessment of groundwater quality should be performed to determine the extent of contamination (if any).

79. UNIT NAME: Ammunition Burning Grounds (ABG)

Unit Description: This unit is a 40 acre site in which various explosives are "thermally treated" (i.e., openly burned). The area is a valley bounded by ridges. Little Sulfur Creek runs through the middle of the valley. This unit encompasses other SWMUs (Units 80, 81, 82, 83, and 84). The unit has been regulated under CERCLA (Ref. 6 p. E-2) and has been studied by the U.S. Army Corps of Engineers since 1981 (Ref. 6 p. E-2). Sixteen monitoring wells have been installed around the Unit.

Date of Start-Up: 1940's.

Date of Closure: The unit is currently active.

Waste Managed: Open burning of ordnance and ordnance contaminated materials (TNT, RPX, HMX, heavy metals, and organics) has taken place since 1965 (Ref. 3, p. 2-3). Over 10,000 major weapons were destroyed on this site including waste explosives, propellants, and pyrotechnics (Ref. 3, p. 6-62). Prior to 1965, the area was used as a munitions testing area. From 1981 to 1984, 1,783 to 3,770 tons per year of wastes were burned (Ref. 20).

Release Controls: The unit consists of several open burning areas with no release control. Burning of propellants has recently been conducted in metal burning pans instead of the ground surface (Ref. 20).

<u>Release History</u>: Seven organic compounds were identified in monitoring wellls with concentrations exceeding 50 ppb (Ref. 13, p. 19). The groundwater at the unit is mounded with flow to the east, south, and west (Ref. 13, p. 21). The contaminant plume is oval shaped with an approximate 180 ft. width and 325 length. The U.S. Army Corps of Engineers were coring on the northwest side of the ABG during the VSI (Ref. 20).

Burning was taking place during the VSI with large clouds of white smoke filling the west side of the Valley (Ref. 20).

Conclusions: Soil/Groundwater: There is documented contamination of soil due to open burning of wastes on the ground surface (Ref. 20).

Surface Water: The potential for release to surface water is high due to the proximity of Little Sulphur Creek and the lack of release controls to prevent run-off at the unit.

Air: The potential for release to air is high during open burning of explosive wastes.

Subsurface Gas: The potential for generation of subsurface gas is low due to the open nature of the unit.

Suggested Further Action: Continued assessment of groundwater quality should be performed to determine the extent of contamination.

80. UNIT NAME: Sludge Dewatering Units (ABG) (Ref. 6, p. B-4 and 5)

Unit Description: Three single shell, steel, sludge dewatering units with a capacity of 14,500 gallons per unit are located at the Ammunition Burning Grounds (Unit 79). These units are RCRA interim status units (Ref. 6, p.E-1).

Explosive sludge is placed into the unit and dewatered by filtration. The liquid waste (filtrate) is collected by an underdrain system. The dewatered sludge is then ignited, and burned in place. The units have a "metal cover" that is removed after dewatering, but before the dewatered sludge is burned (Ref. 6, p. C-7).

Sludge Dewatering Units #1 and #2 receive sludge from Buildings 146, 160 and the Rockeye Area. Sludge Dewatering Unit #3 receives sludge from the pyroproduction line (Building 133) (Ref. 6, p. B-4 and 5).

Filtrate from each unit goes into underground holding tanks. Filtrate from Sludge Dewatering Units #1 and #2 is treated at Building 160 (Unit 54) or 3004 (Unit 6) and discharged under NPDES authority (Ref. 6, p. B-5). Filtrate from Sludge Dewatering Unit #3 is sampled and analyzed; if determined hazardous, it is containerized and stored at the Central Storage Facility (SWMU No. 60). If determined non-hazardous, it is discharged to the Sanitary Sewer System (Unit 76).

Date of Start-Up: 1975

Date of Closure: The units are currently active (Ref. 6, p. D-23).

Waste Managed: Wastes managed are pyrotechnic liquid sludges. Sludge in Units #1 and #2 contains RDX, HMX, and TNT. Sludge handled by Unit #3 is a red phosphorous sludge.

<u>Release Controls</u>: Each unit is lined with a single synthetic 30 mil PVC liner (Ref. 6, p. D-23). Filtrate is collected via a 6 inch PVC perforated pipe installed at the base of each unit. According to a June 25, 1986 letter from NWSC to the USEPA, Crane plans to retrofit the Sludge Dewatering Units with a double liner to meet the November 8, 1988 deadline. Currently the units have a single PVC membrane with a sand and clay base (Blueprint #4315). The units dikes were constructed of local clay with an average permeability of 3.6 X 10^{-6} cm/sec (Ref. 6, Appendix D-13-2).

Soil borings in the area close to the Sludge Dewatering Units indicate that there is an average of 6.7 ft of soil characterized as sandy clay. (Ref. 6, Appendix D-13-2). The soil is underlain by a sandstone of the Hardinsburg Formation.

<u>Release History</u>: The units are monitored by a series of eight groundwater monitoring wells. These wells are installed by the U.S. Army Corps of Engineers to comply with RCRA regulation Subpart F. In June 1983, four additional wells were installed at the ABG, but are considered observation wells for the Ash Pile (Unit 82).

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is moderate to high due to possible liner disturbance during burning of wastes within the unit.

Surface Water: The potential for release to surface water is low due to the collection of filtrate in underground storage tanks.

Air: The potential for release to air is high during burning of the wastes.

Subsurface Gas: The potential for generation of subsurface gas is low due to the nature of the wastes and design of the unit.

Suggested Further Action: Continued assessment of groundwater quality should be performed to determine the extent of contamination.

81. UNIT NAME: Underground Storage Tanks (ABG) (Ref. 5)

Unit Description: This unit consists of three tanks used to collect filtrate from the SDUs (Unit 80). The tank associated with SDUs #1 and #2 are 25,000 gallon steel tanks and the steel collection tank associated with SDU #3 holds 12,000 gallons (Ref. 5). These units were deleted from the RCRA Part A application because wastewater storage is less than 90 days (Ref. 5).

Date of Start-Up: December 1983 (Ref. 1).

Date of Closure: The units are currently active.

Waste Managed: The first two tanks collect waste explosive pyrotechnic pink water filtrate and the third tank collects red phosphorous contaminated wastes. Generally, one million gallons per year are stored in the tanks (Ref. 20). When the tank is full, the wastewater is recycled via a vacuum truck to the Rockeye Carbon Treatment Facility.

Release Controls: According to facility representatives the volume of each tank is checked daily to monitor for leakage, the volume of wastewater is logged to ensure there are no leaks. On occasion, fluid levels have risen due to unreported sludge disposal in the SDUs and subsequent filtrate influent into the tanks (Ref. 20).

Release History: On one occasion, a pipe burst, leaking water into the tank. Measurement of volume indicated that the quantity of liquid had increased, not decreased (Ref. 20).

Conclusions: <u>Soil/Groundwater</u>: The potential for release to soil/groundwater is low due to the relatively young age of the tanks.

<u>Surface Water</u>: The potential for release to surface water is low because the units are underground tanks with only a transfer pipe for surface outlet.

<u>Air</u>: The potential for release to air is low due to the design of the unit and the nature of the wastes.

<u>Subsurface Gas</u>: The potential for generation of subsurface gas is low due to the nature of the wastes.

Suggested Further Action: No further action is suggested for this unit at this time.

82. UNIT NAME: Ash Pile (ABG) (Ref. 6, p. B-6)

Unit Description: The ash pile was a RCRA interim status unit that had a capacity of 12,300 $yd.^3$. The unit was described as an open pile of heterogeneous ash and metal fragments. Presently, the area is excavated with some loose soil on the upslope side of the former pile area (Ref. 20). The unit is located on a moderate slope above a parking lot on the western side of the ABG (Ref. 20)..

Date of Start-Up: 1945

Date of Closure: This unit became inactive in 1982. According to facility representatives, ash and soil have been recently removed to an off-site disposal area (Ref. 20). Closure is not complete. However, closure activities are proceeding under a semi-approved closure plan. Presently, closure is proceeding with verbal approval (Ref. 20).

Waste Managed: The waste type disposed of in the unit was listed as ash and residue from open burning of explosives and pyrotechnics. Hazardous constituents are: TNT, RDX, HMX, etc. Currently, ash is placed in roll-off boxes and removed by contractor.

Release Controls: A closure plan has been submitted to the Indiana Department of Environmental Management. NWSC planned to remove the pile beginning July 1, 1986 (Ref. 8, p. 22). The unit was an open pile of ash situated on a moderate slope on the western side of the ABG (Ref. 20).

Release History: Results of a 24 foot soil core sample showed elevated levels of lead, barium, RDX and TNT. Four monitoring wells were installed in 1983. Analysis information was not provided (Ref. 14). The unit is located on a hillside underlain by the Hardinsburg Sandstone and the Golconda Limestone. The groundwater gradient is very steep reflecting the topographic change (Ref. 14, p.6).

UNIT 82. (Continued)

Conclusions: Soil/Groundwater: There is documented soil/groundwater contamination from this unit due to the open storage/disposal of wastes on an open ground surface.

Surface Water: The potential for release to surface water in the past was high due to the lack of run-off controls on the pile and the proximity of Little Sulphur Creek.

Air: The potential for release to air was low due to the nature of the wastes..

Subsurface Gas: The potential for generation of subsurface gas was low due to the nature of the wastes.

Suggested Further Action:

1. Continued assessment of groundwater quality should be performed to determine the extent of contamination.

2. Closure should be completed under the State approved Closure Plan.

83. UNIT NAME: Ash Roll-Off Boxes (ABG)

Unit Description: Four steel roll-off boxes are used to store residual ash from the SDUs (Unit 80). The boxes are then removed for off-site disposal of the ash. These boxes are stored on a soil pad and are covered with tarpaulins (Ref. 20). The boxes took the place of the ABG Ash Pile (Unit 82).

Date of Start-Up: Approximately 1982

Date of Closure: The units are currently active.

Waste Managed: Residual ash from explosive contaminated sludges and unburned metal scraps are stored in the units.

Release Controls: The units are covered (removable tops) and are located over a soil pad (Ref. 20).

Release History: Unknown.

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is low due to the apparent good condition of the units.

Surface Water: The potential for release to surface water is low due to the design of the units.

Air: The potential for air release is generally low except during ash transfer when particulate generation may occur.

Subsurface Gas: There is no potential for generation of subsurface gas due to the above-ground nature of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

84. UNIT NAME: Open Burning Area (ABG)

Unit Description: This unit is an open area at the northern end of the ABG that covers approximately one acre (Ref. 20). Explosive contaminated wood and other scrap items are openly burned in a large pile.

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: Wooden cartons, pallets, and scrap wood that is potentially contaminated with explosives is openly burned on the ground surface.

Release Controls: There are no release controls employed at the unit. There was no defineable boundary to the unit (i.e. wood scraps at variable places within a general area).

Release History: Unknown.

Conclusions:

<u>Soil/Groundwater</u>: The potential for release to soil/groundwater is high due to open burning on the ground.

<u>Surface Water</u>: The potential for release to surface water is high due to the lack of release controls and the proximity of Little Sulphur Creek.

<u>Air</u>: The potential for release to air is high during burning of the wastes.

<u>Subsurface Gas</u>: The potential for generation of subsurface gas is low due to the open nature of the unit.

Suggested Further Action:

1. Secondary containment should be employed to prevent run-off.
2. Soil sampling should be performed to determine the extent of contamination from the unit (if any).

85. UNIT NAME: Dye Burial Grounds (Ref. 3, p. 2-4)

Unit Description: This unit was an unlined disposal pit for waste dyes. The unit consisted of 3 main trenches 10 ft. wide X 6 ft. deep X 50 ft. long (Ref. 3, p. 6-62). The area is presently heavily vegetated (small trees) with a dirt access road over a section of the former unit (Ref. 20).

Date of Start-Up: 1952

Date of Closure: 1964

Waste Managed: Approximately 50 tons of toxic and carcinogenic waste dyes used in pyrotechnic development were disposed in the unit.

Release Controls: The unit consisted of three unlined pits.

Release History: Seven monitoring wells surround the burial grounds, no monitoring data was available for review (Ref. 20).

UNIT 85. (Continued)

Conclusions: Soil/Groundwater: There is suspected soil/groundwater contamination from this unit due to the disposal of liquid wastes in unlined trenches.

Surface Water: The potential for release to surface water is low due to the heavy vegetative cover over the unit.

Air: The potential for release to air is low due to the soil cover over the unit and the inactivity of the unit.

Subsurface Gas: The potential for generation of subsurface gas is low due to the nature of the wastes disposed of in the unit.

Suggested Further Action: Continued assessment of groundwater quality should be performed to determine the extent of contamination (if any).

86. UNIT NAME: Sanitary Landfill

Unit Description: This landfill is unlined and covers an area of 65 acres, with a capacity of 4.2 million cubic yards. The unit receives 1000 cubic yards of waste per day. The landfill is licensed by the State of Indiana, operating permit No. 51-2 (Ref. 1). There is one active cell and one cell that is ready to accept wastes (Ref. 20). The area is filled by the trench method, and has a capacity remaining of 1.5 years. The landfill is currently undergoing redesign to an area fill operation which will extend the capacity to receive wastes to approximately 25 years (Ref. 20). There are several monitoring wells in place around the unit.

Date of Start-Up: 1972.

Date of Closure: This unit is currently active.

Waste Managed: The landfill receives plant trash, demolition and construction debris, and excess polyester filling from the warhead pressing area in Building 105 (Ref. 13, p. 617). The unit also received asbestos waste and barium sulfate in the past as approved by the State of Indiana (Ref. 20).

Release Controls: The landfill is unlined, but rests on "clayey' soils with low permeability. Infiltration from groundwater into the fill and leachate from each fill area are collected by the Leachate Collection System (4 inch perforated PVC piping) which is directed to the Leachate Pond (Unit 87) and finally to the Sanitary Sewage Treatment Plant (Ref. 20). The fill area is required to be covered at the end of each day with topsoil. However, the VSI team visited the unit at 4:00 p.m., and the wastes were not covered.

Release History: Monitoring data were not available for review (Ref. 20).

Conclusions:

Soil/Groundwater: The potential for release to soil/groundwater is high due to the fact that the unit is unlined and is open to filtration of precipitation.

Surface Water: The potential for release to surface water is low due to the design of the unit and its distance from any local surface drainage.

Air: The potential for release to air is low due to the nature of the wastes disposed in the unit.

Subsurface Gas: The potential for generation of subsurface gas is high due to the disposal of sanitary garbage in the unit and subsequent soil covering.

Suggested Further Action:

1. Continued assessment of groundwater quality should be performed to determine the extent of contamination (if any).

2. Further investigation is required to determine if subsurface gas is accumulating.

67. UNIT NAME: Sanitary Landfill Leachate Collection Ponds

Unit Description: This unit consists of two unlined excavated ponds with a total capacity of 30,000 gallons. Each pond is at the base of the landfill below the elevation of the fill. The units were partially ice-covered during the VSI and had approximately 1 ft. of freeboard (Ref. 20).

Date of Start-Up: Approximately 1979 (Ref. 20).

Date of Closure: These units are currently active.

Waste Managed: Waste received is leachate from the sanitary landfill. The leachate is pumped from the unit into the sanitary sewer for treatment at the sewage treatment plant.

Release Controls: The units are unlined ponds with continuous feed to the sanitary sewer system.

Release History: Unknown.

Conclusions: Soil/Groundwater: The potential for release to groundwater is high because the units are unlined.

Surface Water: The potential for release to surface water is low due to continuous feed of leachate into the sewer system by a pump house. During periods of high rainfall, this potential would be high due to lack of freeboard on the ponds.

Air: The potential for release to air is low due to the nature of the wastes.

Subsurface Gas: The potential for generation of subsurface gas is low due to the open nature of the unit and the dilute nature of the wastes.

Suggested Further Action: Continued assessment of groundwater quality should be performed to determine the extent of contamination (if any).

88. UNIT NAME: Sewage Sludge Land Application Area (Landfarm) (Ref. 1)

Unit Description: This unit consists of 18 miles of roadside where liquid sludge front the sewage treatment plant is land applied. This procedure is occurring with verbal agreement (interim authorization) by the State of Indiana; it has not yet been permitted by the State (Ref. 20). A permit is currently being negotiated. The VSI documented a roadside area along Highway 26A where sludge was spread (Ref. 20).

Date of Start-Up: 1980 (Ref. 1)

Date of Closure: The unit is currently active.

Waste Managed: Sludge that is accumulated in the aerobic digestor at the Sewage Treatment Plant is spread along 18 miles of roadside by a vacuum truck. Approximately 40,000 gallon of sludge per month is land applied (Ref. 1). The sludge contains three percent solids.

Release Controls: There are no release controls associated with this unit. According to facility representatives, the State of Indiana requires a separate spray nozzle system.

Release History: Past routes of land application were not provided.

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is high due to open disposal on the ground surface.

Surface Water: The potential for release to surface water is high due to the proximity of intermittent streams and slopes along areas where land application is conducted.

Air: The potential for release air is low due to the nature of the wastes.

Subsurface Gas: The potential for generation of subsurface gas is low due to the open nature of the unit.

Suggested Further Action: Continued compliance under agreement with the State of Indiana.

89. UNIT NAME: PCB Storage Facility

Unit Description: This TSCA regulated unit was identified during the VSI. This unit consists of one enclosed metal building with a concrete floor that is sloped inward from the access door. It is located slightly north of the Sanitary Landfill (Unit 86).

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: Electrical transformers are stored on metal and wooden pallets. NWSC contracts out for drainage and removal of the transformers (Ref. 20).

Release Controls: The transformers are stored on pallets over a concrete floor. There is no collection sump in the building for possible spills.

Release History: Unknown.

UNIT 89. (Continued)

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is low due to the concrete pad and inward sloped floor.

Surface Water: The potential for release to surface water is low due to the nature of the wastes and the inward sloped floor.

Air: The potential for release to air is low due to the nature of the wastes stored at the unit.

Subsurface Gas: There is no potential for generation of subsurface gas due to the design of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

90. UNIT NAME: Sedimentation Ponds 2, 3, and 4

Unit Description: These three units are unlined diked earthen retention ponds designed to capture possibly contaminated run-off from the Demolition Range (Unit 58) (Ref. 20). Pond 002 covers an area of 4 acres; pond 3, an area of 1 acre; and pond 4, an area of 8 acres. Each pond serves to settle out solids in run-off prior to NPDES discharge.

Date of Start-Up: 1984.

Date of Closure: These units are currently active.

Waste Managed: The unit collects surface run-off contaminated with residual explosives from the Demolition Range.

Release Controls: The ponds are unlined. The pH is adjusted with soda ash at the outfall to pond 4. Freeboard at each pond appeared to be adequate.

Release History: One of the ponds (NPDES 004) had a lowered level of PH (5.3) and NWSC representatives set up a line feed system to treat the water as it was discharged (Ref. 20). Each pond has an outfall that is regulated by NPDES permit.

Conclusions:

Soil/Groundwater: The potential for release to soil/groundwater is moderate due to the nature of the wastestream.

Surface Water: The potential for release to surface water is moderate due to the nature of the wastestream.

Air: The potential for release to air is low due to the dilute nature of the wastestream.

Subsurface Gas: The potential for generation of subsurface gas is low due to the open nature of the unit and the dilute nature of the wastestream.

Suggested Further Action:

1. Surface water sampling should be performed to determine levels of explosives and other contaminants from wastes treated at the Demolition Range.

2. Sediment samples should be taken to determine levels of explosives and other contaminants from wastes treated at the Demolition Range.

Section 20

91. UNIT NAME: Pyro Test Area (Ordnance Testing Area)

Unit Description: This unit consists of a large open field and a concrete building used for quality assurance test burning of pyrotechnic lots. Boggs Creek flows through the center of the testing field.

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: Residual deposits from quality assurance testing of pyrotechnics are generated at this unit.

Release Controls: There are no provisions for release control. Residual deposits are usually left in place (Ref. 20).

Release History: Unknown. There is no groundwater monitoring of this area.

UNIT 91. (Continued)

Conclusions: <u>Soil/Groundwater</u>: There is a moderate potential for release to soil/groundwater due to open ignition of pyrotechnics over the ground surface.

<u>Surface Water</u>: There is a moderate potential for release to surface water due to open ignition of pyrotechnics over the ground surface and the proximity of Boggs Creek.

<u>Air</u>: The potential for release to air is high during ignition of pyrotechnics.

<u>Subsurface Gas</u>: There is a low potential for generation of subsurface gas due to the open nature of the unit and the nature of the wastes handled.

Suggested Further Action:

1. Soil sampling should be conducted to determine if there is any contamination from residual material from pyrotechnic ignition.

2. Surface water/sediment sampling should be performed to determine the extent of contamination into Boggs Creek.

*92. UNIT NAME: Test Track

Unit Description: **This unit was identified as a possible SWMU on one of the NWSC Crane section maps. Facility representatives were not familiar with the terminology. The map indicates that this unit is west of the Pyro Test Area (Unit 91).**

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Unknown.

Release Controls: Unknown.

Release History: Unknown.

UNIT *92. (Continued)

Conclusions: **This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.**

Suggested Further Action: **Obtain information on the design, location and use of the unit; determine current status and condition.**

*93. UNIT NAME: Composition Testing Facility - Decontamination Building- (Building 181) (Ref. 3, p. 6-40)

Unit Description: This unit was used for the sawing and inspection of bombs (Ref. 20). Wastewater was collected in a barrel. The barrel overflowed onto the ground and into an intermittent stream (Ref. 3). Facility representatives stated that this area is presently used for lithium battery testing (Ref. 20).

Date of Start-Up: Unknown.

Date of Closure: Presently, lithium battery testing is conducted within Building 181.

Waste Managed: The wastewater collected was contaminated with explosives (i.e., TNT, RDX, HMX).

Release Controls: Unknown.

Release History: Prior to cessation of bomb sawing and inspection, wastewater flowed into an intermittent stream.

UNIT *93. (Continued)

Conclusions:	The unit was not observed during the VSI. However, past release history indicates a high potential for release to surface water.
<u>Suggested Further Action</u>:	Surface water/sediment sampling should be performed to determine the extent of contamination (if any).

*94. UNIT NAME: Rocket Range

Unit Description: This unit was identified on a NWSC, Crane section map. The VSI team was able to observe the general area from a distance but did not have clearance to enter (Ref. 20). The area consisted of an open field, a drop tower, and a canopy building.

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: It is assumed that residual deposits from test burns of rockets are generated at this unit.

Release Controls: Unknown.

Release History: Unknown.

UNIT *94. (Continued)

Conclusions:	Insufficient information was available to develop conclusions regarding release potentials to the various pathways.
Suggested Further Action:	Obtain information on design and current condition of the unit.

95. UNIT NAME: Restored Mustard Gas Burial Area (Ref. 2, p.3; Ref. 3, p. 2-4)

Unit Description: This unit covers 10 acres in the southeast corner of the facility. This area is presently heavily vegetated. An old 4ft. barbed wire fence exists around the perimeter. Facility representatives stated that the wastes had been excavated and removed to a Nuclear Regulatory Commission site (Ref. 20). Twelve monitoring wells were installed around the unit (Ref. 13, p.6).

Date of Start-Up: Unknown.

Date of Closure: Not provided; the unit is currently inactive.

Waste Managed: Mustard Gas Bombs and radioactive thorium nitrate were buried in this unit.

Release Controls: Clean-up attemps were made in 1974 and 1980 to neutralize the gas and remove the wastes to an NRC approved landfill. The unit has no release controls other than the natural vegetation that is covering it. The unit is underlain by 2 to 15 feet of silty clay soil and interbedded sandstone and shale of the Pennsylvanian Mansfield Formation. The groundwater table is located at an average of 15.5 feet below the surface (Ref. 13, p. 11).

Release History: Organic contamination of the groundwater was documented in all 12 monitoring wells. Compounds discovered were: 1, 2 - DCA, TCE, TCA, bromoform and dibromochloromethane (Ref. 13, p. 19).

Conclusions: **<u>Soil/Groundwater</u>: There is documented contamination of groundwater at this site.**

<u>Surface Water</u>: There is a low potential for surface water release due to removal of wastes and the heavy vegetative cover.

<u>Air</u>: There is a low potential of release to air due to removal of the wastes.

<u>Subsurface Gas</u>: There is a low potential for generation of subsurface gas due to removal of the wastes.

Suggested Further Action: Continued assessment of groundwater quality should be performed to determine the extent of contamination.

96. UNIT NAME: Temporary Flammable Storage (Ref. 7, p. 1)

Unit Description: This unit, located in Building 1487 magazine, is used for storage of drums containing "unknown wastes" awaiting sampling and analysis before removal to the Central Storage Facility (Unit No. 60) (Ref. 7, p. 7). The unit has a capacity of 85 drums (4250 gallons). The unit is a semi-circular concrete magazine. Only one drum was stored in the unit during the VSI. Facility representatives place this unit in Section 3 (Ref. 20). Drums are stored for less than 90 days.

Date of Start-Up: Unknown.

Date of Closure: The unit is currently active.

Waste Managed: Flammable wastes solvents, paints and sealers, and other undetermined wastes are stored in containers until transport to the CSF.

Release Controls: The unit is a concrete building consisting of thick concrete walls and an epoxy coated concrete floor (Ref. 20).

Release History: There was no visual evidence of any past spillage during the VSI.

UNIT 96. (Continued)

Conclusions: Soil/Groundwater: The potential for release to soil/groundwater is low due to the containerization of wastes and the structure of the unit.

Surface Water: The potential for release to surface water is low due to the structure of the unit and containerization of wastes.

Air: The potential for release to air is low due to the apparent good condition of the storage drum(s).

Subsurface Gas: There is no potential for generation of subsurface gas due to the structure of the unit.

Suggested Further Action: No further action is suggested for this unit at this time.

*97. UNIT NAME: Metal Shaving Collection Area (Ref. 3, p. 6-58)

Unit Description: This unit is a pad upon which oil coated metal shavings were placed prior to reclamation. The size, shape, and materials of construction were unreported. Facility representatives were not familiar with this unit. (Ref. 20).

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Scrap metal/waste oil were reported to be stored in an open pile (Ref. 3, p. 6-58).

Release Controls: Unknown.

Release History: Unknown.

UNIT 97. (Continued)

Conclusions: This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.

Suggested Further Action: Obtain information on the design, operation, release history, and current condition of the unit.

*98. UNIT NAME: 500 Gallon Tank Wagon (Ref. 6, p. B-9)

Unit Description: This 500 gallon tank wagon transports red phosphorous contaminated sludge from the pyro production area (Building 133) to Sludge Dewatering Unit #3 (Unit 80) (Ref. 6, p. B-9).

Date of Start-Up: Unknown.

Date of Closure: Unknown.

Waste Managed: Red phosphorus contaminated sludge is transported by this unit.

Release Controls: Unknown.

Release History: Unknown.

UNIT 98. (Continued)

Conclusions: This unit was no observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.

Suggested Further Action: Obtain information on the design, age and frequency of use of this unit. Determine the integrity of the unit.

*99. UNIT NAME: 3-Ton Pump Truck (Ref. 3, p. B-9)

Unit Description: **This unit has a capacity of 1250 gallons; it is used to transport explosive contaminated sludge to Sludge Dewatering Units 1 and 2 (Unit 80).**

Date of Start-Up: **Unknown.**

Date of Closure: Unknown.

Waste Managed: **Explosive contaminated sludge is transported by this unit.**

Release Controls: Unknown.

Release History: Unknown.

UNIT *99. (Continued)

Conclusions: This unit was not observed during the VSI. Insufficient information was available to develop conclusions regarding release potentials to the various pathways.

Suggested Further Action: Obtain information on the design, age, and frequency of use of this unit. Determine the integrity of the unit.

100. UNIT NAME: Settling Pond Behind Building 106

Unit Description: This unit was identified during the VSI. It is a small unlined pond that, in the past, had received caustic water from a phosphatizing line in Building 107 (Ref. 20). It presently receives oily water from compressors. The water is periodically pumped into the sanitary sewer system via a concrete sump and pump.

Date of Start-Up: Unknown.

Date of Closure: The unit is presently active.

Waste Managed: In the past, caustic waters were discharged to the pond and allowed to flow into an intermittent stream. Presently oily wastewater from compressors in Building 107 enters the pond via several drainage pipes.

Release Controls: The unit is pumped out when liquid level rises. The pumps are manually started (Ref. 20).

Release History: The edges of the pond were oil stained and the surface of the pond exhibited on oily sheen with oil accumulation. Facility representatives stated that malfunction of the pumping system has caused overflow of the pond and subsequently oily water has been released down the slope and into an intermittent stream.

Conclusions:

Soil/Groundwater: There is a high potential for release of oily water to soil/groundwater due to the fact that the pond is unlined and that it has overflowed.

Surface Water: There is a high potential for release to surface water due to the previous documentation of overflow into intermittent stream drainage.

Air: There is a low potential for release to air due to the nature of the wastes handled.

Subsurface Gas: There is a low potential for generation of subsurface gas due to the open design of the unit and the nature of the waste handled.

Suggested Further Action:

1. Soil sampling should be performed to determine extent of contamination (if any).
2. Sediment sampling should be performed to determine extent of contamination (if any).
3. An alternative treatment system should be considered, such as a sump with oil/water separator.

OTHER AREAS OF CONCERN

A. Underground Diesel Fuel/Gasoline Tanks

NWSC has several fueling stations with underground fuel storage tanks. One of the tanks was excavated and stored above-ground near SWMU #61. The tank was in deteriorated condition with obvious spillages near its fill pipe. Old single shelled storage tanks should be inspected to assess their potential for leakage.

B. Stream East of McComish Gorge (Unit 2)

During the visual inspection of McComish Gorge, the inspection team noted a small stream that was discolored by a bright orange-red tint. Facility representatives were not aware of any upstream mining activity. The stream has its headwater in the town of Crane and flows onto the base just north of McComish Gorge. The cause of stream discoloration should be investigated.

C. White Phosphorus to Phosphoric Acid Production Building

This area was identified in Section 12 prior to inspection of Mine Fill B. Surplus white phosphorous will be processed into phosphoric acid via an incineration process. Facility representatives stated that this will take place under the supervision of the State of Indiana as a recycling operation (Ref. 20).

VII. OTHER RELEASE INFORMATION

There is no other release information for the NWSC facility.

VIII. SUMMARY OF SUGGESTED FURTHER ACTIONS

Table 3: Summary of Suggested Further Actions

Unit #	Unit Name	Suggested Further Action
✓ 1	Old Burning Pit	- Continued assessment of groundwater quality should be performed to determine the extent of contamination.
✓ 2	McCormish Gorge Dump	- Continued assessment of groundwater quality should be performed to determine the extent of contamination.
3.	FS Smoke Storage Facility	- No further action is suggested for this unit at this time.
✓ 4.	Rockeye Loading Area Sumps	- Sediment sampling in the surface water tributaries should be performed. - Continued assessment of groundwater quality should be performed to determine the extent of contamination.
✓ 5.	Rockeye Percolation Site	- Soils in the percolation area should be sampled. - Continued assessment of groundwater quality should be performed to determine the extent of contamination.
6.	Rockeye Loading Area Wastewater Treatment Unit - Building 3004	- No further action is suggested for this unit at this time.
7.	Waste Carbon Container Storage Area Outside of Building 3004	- No further action is suggested for this unit at this time.
8.	Paint Waste Container Storage Area at the Rockeye Loading Area	- No further action is suggested for this unit at this time.
9.	Active Solid Fill Site	- No further action is suggested for this unit at this time.
10.	Old Solid Fill Site	- No further action is suggested for this unit at this time.
11.	Above-ground Waste Oil Storage Tank - Building 2801	- No further action is suggested for this unit at this time.

Table 3: Summary of Suggested Further Actions (Cont'd)

Unit #	Unit Name	Suggested Further Action
12.	Classified Papers Incinerator - Building 45	- No further action is suggested for this unit at this time.
13.	Building 136 Sump	- Obtain information on unit operation, release history, current status and condition.
14.	Wastewater Treatment Unit (lead) - Building 136	- Obtain information on unit operation, release history, current status and condition.
15.	Wastewater Treatment Unit - Plating Shop-Building 3064	- No further action is suggested for this unit at this time.
16.	Drum Storage Area behind Building 3064	- No further action is suggested for this unit at this time.
17.	Battery Shop Dump Building 36	- Soils should be sampled on the hillside to verify the conclusions of the NACIP report.
18.	Acid Neutralization Pit	- No further action is suggested for this unit at this time.
19.	PCB Burial Area - (Pole Yard)	- Obtain information of the design and construction of the unit, volume of waste managed, and history of release.
20.	Roads and Grounds Dump Area	1. Soil sampling should be performed to determine the extent of contamination. 2. Sediment sampling of the nearby stream should be performed to determine the extent of contamination.

Table 3: Summary of Suggested Further Actions (Cont'd)

Unit #	Unit Name	Suggested Further Action
21.	PCP Dip Tank	- Soils should be sampled in the former location of the unit to verify the conclusions of the NACIP report.
22.	Building 126 Sump	- Soil samples should be taken near the wall of the sump to determine if any contamination has occurred due to the cracks in the sump.
23.	Dust Collectors - Building 126	- Obtain information on the age, design, and construction of the unit and on the disposition of any wastewater.
24.	Scrap Storage Area Behind Building 126	- No further action is suggested for this unit at this time.
25.	Red Phosphorous Building Sump - Building 1886	- Obtain information on the operation, period/frequency of use, and integrity of the unit.
26.	Building 133 Sump	- No further action is suggested for this unit at this time.
27.	Railroad Maintenance Shop Was Area Building 7	- No further action is suggested for this unit at this time.
28.	Railroad Maintenance Shop Oil/Water Separator	- The unit should be repaired (i.e., function to remove waste oil from wastewater).
29	Auto Maintenance Shop - Building 1820	- No further action is suggested for this unit at this time.
30.	Heavy Equipment Maintenance Shop - Building 1818	- No further action is suggested for this unit at this time.
31.	Truck Wash Area at the Heavy Equipment Maintenance Building	- No further action is suggested for - this unit at this time.

Table 3: Summary of Suggested Further Actions (Cont'd)

Unit #	Unit Name	Suggested Further Action
32.	Oil/Water Separator at the Heavy Equipment Maintenance Building	- No further action is suggested for this unit at this time.
33.	Outside Truck Wash Rack Adjacent to Building 1818	1. Provisions should be made to collect rinse waters and treat the rinsate through the Sewage Treatment Plant. 2. Soils should be sampled underneath the platform and in the drainage ditch that flows down the hillside.
34.	Roll - Off Boxes Outside Building 1820	- No further action is suggested for this unit at this time.
35.	CONEX Hazardous Waste Transfer Containers behind Building 1820	- No further action is suggested at this time.
36.	Oil Pan Wash Out/Disposal Rack Adjacent to Building 1820	1. Soil showing obvious signs of contamination should be removed. 2. Soil sampling should be done after removal of visually contaminated soil to verify that there is no further contamination. 3. Steps should be taken to ensure no future oil spills (i.e. installation of a containment pad and use a larger dip pan).
37.	Underground Waste Oil Storage Tank -- Building 1818	- The integrity of the unit should be inspected.
38.	Underground Waste Oil Storage Tank - Building 1820	- The integrity of the unit should be inspected.
39.	Mechanical Maintenance Shop -- Building 56	- Obtain information on the status and condition of the unit, release controls, and release history.

Table 3: Summary of Suggested Further Actions (Cont'd)

Unit #	Unit Name	Suggested Further Action
40.	400 Gallon Solvent Storage Tank (Building 56 Paint Shop)	- Obtain information on the status and condition of the unit, release controls, and release history.
41.	Red Phosphorous Mixing Emergency Sump	- Obtain information on the age, frequency of use, and integrity of the unit.
42.	Booster Area - Lead Azide Sumps - Building ~~106~~ 134 and ~~107~~ 138	- Determine the location of the sumps. obtain information on design, age, and integrity of the sumps.
43.	Wastewater Treatment Unit Building 3074	- Determine the current status and condition of the unit. Obtain information on unit operation, release controls, and release history.
44.	Lead Azide Loading Pond	- No further action is suggested for this unit at this time.
45.	Open Storage Area Outside Building 2801	- No further action is suggested for this unit at this time.
46.	Cast High Explosives Fill (Building 146)	- Soil sampling should be performed to determine the existence of contamination from the unit.
47.	Central Storage Facility	- No further action is suggested for this unit at this time under the RCRA Corrective Action Program.
48.	APE 1236 Incinerators Building 146	- This unit is RCRA regulated. The units should not be operated until the pollution abatement systems are in good working order.

Table 3: Summary of Suggested Further Actions (Cont'd)

Unit #	Unit Name	Suggested Further Action
49.	Prototype Incinerator Building 146	- This unit is RCRA regulated. The units should be operated until the pollution abatement systems are in good working order.
50.	Defense Reutilization and Marketing Office (DRMO) Hazardous Waste Storage Area	- No further action is suggested for this unit at this time.
51.	DRMO Storage Lot	- No further action is suggested for this unit at this time.
52.	Paint Shop Building 2889	- Soil sampling should be performed to determine the existence of contamination from the unit.
53.	Load and Fill Area -- Buildings 105, 198 and 200	- Obtain information on the design, operation and condition of the unit and additional information on release history.
54.	Wastewater Treatment Unit Building 160	- Determine the current status and condition of the unit. Obtain information on release controls and release history.
55.	Wastewater Treatment Unit - Sewage Plant - Building 3049	- No futher action is suggested for this unit at this time under the RCRA Corrective Action Program.
56.	Old Sludge Drying Beds	- Soil sampling should be performed in the area of the drying beds to determine potential for contamination.
57.	Sewage Sludge Vacuum Truck and Discharge Pad	- No futher action is suggested for this unit at this time.

Table 3: Summary of Suggested Further Actions (Cont'd)

Unit #	Unit Name	Suggested Further Action
58.	Demolition Range	- Continued assessment of groundwater quality should be performed to determine the extent of contamination.
59	Waste Explosive Storage Area at the Demolition Range	- No further action is suggested for this unit at this time.
60.	Pest Control Area Building 2189	- Continued assessment of groundwater quality should be performed to determined the extent of contamination.
61.	Former site of Waste Oil Underground Storage Tank near the Pest Control Area	- Continued assessment of groundwater quality should be performed to determine the extent of contamination.
62.	Drum Storage Area Adjacent to SWMU #61	- No further action is suggested for this unit at this time.
63.	Rifle Range	1. Continued assessment of groundwater quality should be performed to determine the extent of contamination. 2. Surface water/sediment samples should be conducted to determine extent of contamination in the downgradient stream.
64.	Sedimentation Pond #1	1. Surface water sampling should be performed to determine levels of explosives and other contaminants from wastes treated at the Demolition Range. 2. Sediment samples should be taken to determine levels of explosives and other contaminants from wastes treated at the Demolition Range.
65.	Mine Fill A	- Further soil sampling should be performed to determine extent of contamination.
66.	Mine Fill B	- Further soil sampling should be performed to determine extent of contamination.

Table 3: Summary of Suggested Further Actions (Cont'd)

Unit #	Unit Name	Suggested Further Action
67.	Wastewater Treatment Unit - Building 104	- Obtain information on unit design and operation and current condition of unit.
68.	Explosive D Wash Areas	- Sediments should be sampled for explosive waste contaminants in the intermittent streams south of the wash area.
69.	Load and Fill Area Sumps Building 104	- Obtain information on the exact location of the sumps, age, frequency of use, design, and current condition.
70.	Steam Out Unit - Building 160	- Obtain information on unit operation, age, release controls, release history, current status and condition.
71.	Highway 58 Dump Site A	- Continued assessment of groundwater quality should be performed to determine the extent of contamination.
72.	Storage Tanks - Building 104	- Obtain information on age, integrity, release controls, and release history.
73.	Bomb Proof Group	- Obtain information on the design, operation, and condition of the unit and on age, types of wastes managed, and release history.
74.	DRMO Salvage Yard	- No further action is suggested for this unit at this time.

Table 3: Summary of Suggested Further Actions (Cont'd)

Unit #	Unit Name	Suggested Further Action
75.	Heavy Equipment Storage Area - Building 2189	- Obtain information on unit operation and types of wastes managed.
76.	Sanitary Sewer System	- Completion of the dye tracer study.
77.	Turkey Creek Quarry	- Obtain information on unit operation and types of wastes managed.
78.	Highway 58 Dump Site B	- Continued assessment of groundwater quality should be performed to determine the extent of contamination.
79.	Ammunition Burning Grounds (ABG)	- Continued assessment of groundwater quality should be performed to determine the extent of contamination.
80.	Sludge Dewatering Units (ABG)	- Continued assessment of groundwater quality should be performed to determine the extent of contamination.
81.	Underground Storage Tanks (ABG)	- No further action is suggested for this unit at this time.
82.	Ash Pile (ABG)	1. Continued assessment of groundwater quality should be performed to determine the extent of contamination. 2. Closure should be completed under a State approved closure plan.
83.	Ash Roll-off Boxes (ABG)	- No futher action is suggested for this unit at this time.
84.	Open Burning Area (ABG)	1. Secondary containment should be employed to prevent runoff. 2. Soil samples should be taken to determine the extent of contamination.

Table 3: Summary of Suggested Further Actions (Cont'd)

Unit #	Unit Name	Suggested Further Action
85.	Dye Burial Grounds	- Continued assessment of groundwater quality should be performed to determine the extent of contamination.
86.	Sanitary Landfill	1. Continued assessment of groundwater quality should be performed to determine the extent of contamination. 2. Further investigation is required to determine if subsurface gas is accumulating.
87.	Sanitary Landfill Leachate Collection Ponds	- Continued assessment of groundwater quality should be performed to determine the extent of contamination.
88.	Sewage Sludge Land Application Area (Landfarm)	- Continued compliance under agreement with the State of Indiana
89.	PCB Storage Facility	- No further action is suggested for this unit at this time.
90.	Sedimentation Ponds 2, 3, and 4	1. Surface water sampling should be performed to determine levels of explosives and other contamination from the Demolition Range. 2. Sediment samples should be taken to determine levels of explosives and other contaminants from the Demolition Range.
91.	Pyro Test Area (Ordnance Testing Area)	1. Soil sampling should be conducted to determine if there is any contamination from residual material due to pyrotechnic ignition. 2. Surface water/sediment sampling should be performed to determine the extent of contamination of Boggs Creek.
92.	Test Track	- Obtain information on the design, location, operation, and condition of the unit.

Table 3: Summary of Suggested Further Actions (Cont'd)

Unit #	Unit Name	Suggested Further Action
93.	Composition Testing Facility - Decontamination Building 181	- Surface water/sediment sampling should be performed to determine the extent of contamination.
94.	Rocket Range	- Obtain information on the design and condition of the unit.
95.	Restored Mustard Gas Burial Area	- Continued assessment of groundwater quality should be performed to determine the extent of contamination.
96.	Temporary Flammable	- No further action is suggested for this unit at this time.
97.	Metal Shavings Collection	- Obtain information on the design, operation, and condition of the unit.
98.	500 Gallon Tank Wagon	- Obtain information on the design, age, frequency of use, and condition of the unit.
99.	3-Ton Pump Truck	- Obtain information on the design, age, frequency of use and condition of the unit.
100.	Settling Pond behind Building 106	1. Soil sampling should be performed to determine extent of contamination. 2. Sediment sampling should be performed to determine extent of contamination in surface drainage adjacent to unit. 3. An alternative treatment system should be considered, such as a sump with oil/water separator.

IX. LIST OF REFERENCES

1. Solid Waste Management Unit Response Letter, Volume I, Section II, subsects. 1.0, 2.0, June 13, 1985.

2. Solid Waste Management Unit Study-CERCLA Sites: in Solid Waste Management Unit Response Letter, Volume I, Section III, June 13, 1985.

3. Initial Assessment Study Of Naval Weapons Support Center, Crane, Indiana, Navy Assessment and Control of Installation Pollutants, May 1983: in Solid Waste Management Unit Response Letter, Appendix H, June 13, 1985.

4. Hydrogeologic Investigation of Waste Disposal Sites at The NWSC, Crane, Indiana, Geotech. Lab., USAE Waterways Experiment Station, April 1982.

5. RCRA Part A Permit Application, October 12, 1984.

6. RCRA Part B Permit Application, October 12, 1984.

7. Part A Completeness Review Deficiency Response, NWSC IN5170023498, May 7, 1986.

8. Part B Completeness Review Deficiency Response, NWSC IN5170023498, April 29, 1986.

9. Potential Hazardous Waste Site Preliminary Assessment, Part 3, April 16, 1981.

10. Hazardous Waste Permit Application for NWSC, Nov. 18th, 1980.

11. Part A Completeness Review - Deficiency Response, NWSC Crane, April 29, 1986.

12. Spill Contingency Plan, NWSC, Crane, Indiana, November 1980.

13. Appendix B, Definition Of Contaminated Ground-Water Plumes at Selected Waste Disposal Sites, NWSC, Crane, Indiana, April 1984.

14. Appendix E, Hydrogeology of ABG, Ash Pile, NWSC, Crane, Indiana, February 1984.

15. RCRA Facility Review For Solid Waste Management Units, EPA, Region V, September 25, 1985.

16. Letter from J.D. Faris (NWSC) to Martin Hamper, U.S. EPA Region V, June 25, 1986.

IX. LIST OF REFERENCES (Continued)

17. Facility Management Plan Approval, Martin Hamper, U.S. EPA Region V, June 27, 1986.

18. Compendium of Paleozoic Rock-Unit Stratigraphy in Indiana - A Revision, State of Indiana Geological Survey, Bulletin 59, 1986.

19. Telephone Conversation with Henry Gray, Head Stratigrapher, IN GS, January 28, 1987.

20. Visual Site Inspection Field Notes, A. T. Kearney Inc., February 17, 18, 19, and 20, 1987.

21. Climates of the States, 1985, Gale Research Co., Vol I, 758p.

X. ATTACHMENTS

A. Attachment 1 is the Visual Site Inspection Summary.

B. Attachment 2 is the Visual Site Inspection Photo Log.

C. Attachment 3 is the SWMU Location Map.

D. Attachment 4 is the Preliminary Review Form.

ATTACHMENT A

Visual Site Inspection Summary

Naval Weapons Support Center (NWSC)
Crane, Indiana

Date: February 17-20, 1987

Participants: Donald A. Ruggery, Jr. (ATK)
Vanessa Harris (ATK)

Facility Representatives:

James Hunsicker - Environmental Manager - Navy
Phil Keith - Environmental Assistant - Navy
Jo Kay Belcher - Engineering Technician - Navy
Randall Burcham - Environmental Coordinator - Army
Brian DeMonia - Environmental Protection Specialist - DRMO

The above listed facility representatives were not all present for the entire four day site visit. Each representative's presence is noted in the field book when accompanying the VSI team.

Conditions: The weather was cold and windy with light snow and sleet. Temperatures were in the mid teens to low twenties (°F).

Day 1 -- Tuesday, February 17, 1987

The participants met with Jim Hunsicker (NWSC Crane Environmental Protection Branch Manager), Phil Keith (NWSC Crane Environmental Assistant), and Randall Burcham (Crane Army Ammunitions Environmental Coordinator) to review the objectives of the Visual Site Inspection. Hunsicker and Burcham provided a brief historical description of the facility's operation. The team then discussed preliminary findings from the file review and logistics of the site visit agenda. Because of the large number of potential SWMU's, the remainder of the day was spent discussing potential SWMU's and information requirements.

Day 2 -- Wednesday, February 18, 1987

The VSI participants, guided by Phil Keith, toured Sections 7, 8 12 and 16 of the facility. Sixty-eight percent of the potential SWMU's are located in these areas. The presence of significant snow-cover prevented the participants from viewing units that were outside. Twenty-seven potential SWMU's were observed. Army facilities were not inspected because clearance had not been granted.

ATTACHMENT A

Visual Site Inspection Summary

Naval Weapons Support Center (NWSC)
Crane, Indiana (Continued)

Day 3 -- Thursday, February 19, 1987

The participants, guided by Jim Hunsicker, toured Sections 1, 2, 3, 6, 14 and 20. The outside units in Sections 7, 8 and 12 were also inspected. Thirty-six potential SWMU's were observed.

Day 4 -- Friday, February 20, 1987

The participants toured the Sewage Treatment Plant, guided by Jo Kay Belcher. The participants then inspected the remainder of the facility, guided by Jim Hunsicker and Phil Keith. The participants were only able to inspect the outside of several Army Production Areas because these operations were closed. Twenty-six potential SWMU's were observed including the army areas.

Facility Representatives provided a complete copy of a NACIP report on NWSC, confirmation studies of the NACIP report by the Hazardous Materials Technical Center, and a clean copy of a facility map.

The following lists all of the units that were observed during the VSI. Out of 100 identified SWMUs, 25 were not inspected during the VSI.

<u>Units Observed During the VSI</u>

Unit No.	Unit Name
1.	Old Burning Pit
2.	MC Comish Gorge
3.	FS Smoke Storage Facility Bldgs. 1008, 1815, 1816, 2646, and 1794
4.	Rockeye Loading Area Sumps
5.	Rockeye Loading Area Percolation Site
6.	Rockeye Loading Area Wastewater Treatment Unit Bldg. 3004
7.	Waste Carbon Container Storage Area Oustide of Bldg. 3004
8.	Paint Waste Container Storage Area at the Rockeye Loading Area
9.	Active Solidfill Site
10.	Old Solidfill Site
11.	Aboveground Waste Oil Storage Tank Bldg. 2801
12.	Classified Papers Incinerator Bldg. 45
*	
*	
15.	Wastewater Treatment Unit-Plating Shop-Bldg 3069
16.	Drum Storage Area Behind Bldg. 3064
17.	Battery Shop Dump
18.	Acid Neutralization Pit
*	
20.	Roads and Grounds Dump Area
21.	PCP Dip Tank

ATTACHMENT A

Visual Site Inspection Summary

Naval Weapons Support Center (NWSC)
Crane, Indiana (Continued)

22. Bldg. 126 Sump
*
24. Scrap Storage Area Behind Bldg. 126
*
26. Bldg. 133 Sump
27. Railroad Mt. Shop Wash Area-Bldg. 7
28. Railroad Mt. Shop Oil/Water Separator
29. Auto Mt. Shop Bldg. 1820
30. Heavy Equipment Mt. Shop Bldg. 1818
31. Truck Wash Area at the Heavy Equipment Mt. Bldg.
32. Oil/Water Separator at the Heavy Equipment Mt. Bldg.
33. Outside Truck Wash Rack Adjacent to Bldg. 1818
34. Roll-Off Boxes Outside Bldg 1820
35. CONEX Hazardous Waste Transfer Containers
36. Oil Pan Wash Out/Disposal Rack Adjacent to Bldg. 1820
37. Underground Waste Oil Storage Tank Bldg. 1820
38. Underground Waste Oil Storage Tank Bldg. 1818
*
*
*
43. Wastewater Treatment Unit Bldg. 3074/Booster Area
44. Lead Azide Loading Pond - Bldg. 106
45. Open Storage Area Outside Bldg. 2801
*
47. Central Storage Facility (CSF)
48. APE 1236 Incinerators
49. Prototype Incinerator
50. Defense Reutilization and Marketing Office (DRMO) Hazardous Waste Storage Area
51. DRMO Storage Lot
*
55. Wastewater Treatment Unit - Sewage Plant - Bldg. 3049
56. Old Sludge Drying Beds
57. Sewage Sludge Vacuum Truck and Discharge Pad
58. Demolition Range
59. Waste Explosive Storage Area at the Demolition Range
60. Pest Control Area Bldg. 2189
61. Former Site of Waste Oil Underground Storage Tank
62. Drum Storage Area Adjacent to SWMU #61
63. Rifle Range
64. Sedimentation Pond #1
65. Mine Fill A
66. Mine Fill B
*

ATTACHMENT A

Visual Site Inspection Summary

Naval Weapons Support Center (NWSC)
Crane, Indiana (Continued)

68. Explosive D Wash Areas Bldg 104 (105, 198, 200)
71. Highway 58 Dump Site A
*
74. DRMO Salvage Yard
76. Sanitary Sewer System
78. Highway 58 Dump Site B
79. Ammunition Burning Grounds (ABG)
80. Sludge Dewatering Units (ABG)
81. Underground Storage Tanks (ABG)
82. Ash Pile (ABG)
83. Ash-Roll-Off Boxes (ABG)
84. Open Burning Area (ABG)
85. Dye Burial Grounds
86. Sanitary Landfill
87. Sanitary Landfill Leachate Collection Ponds
88. Sewage Sludge Land Application Area (Landfarm)
89. PCB Storage Facility
90. Sedimentation Ponds 2, 3, and 4
91. Pyro Test Area (Ordnance Testing Area)
*
94. Rocket Range
95. Restored Mustard Gas Burial Area
96. Temporary Flammable Storage
*
100. Settling Pond Behind Bldg. 106

APPENDIX B

DATA QUALITY OBJECTIVES MEETING MINUTES

DQO Meeting Minutes
For Development
Of the UFP-SAP
For SWMU 29 PCP Dip Tank

Date of Meeting: December 16, 2010 (via teleconference)

Meeting Location: Environmental Office, NSA Crane; Crane, IN and Indianapolis, IN

Attendee/Location: Tom Brent, Crane Environmental / NSA Crane
Doug Griffin, IDEM / IDEM office - Indianapolis, IN
Ralph Basinski, Tetra Tech / NSA Crane
Joe Lucas, Tetra Tech / NSA Crane

Report prepared by: Joe Lucas – 412-921-8882, prepared: December 20, 2010

Tetra Tech presented background information and the proposed sampling plan for the SWMU 29 PCP Dip Tank. Given below is a summary of the information and specific issues discussed during the teleconference regarding SWMU 29.

1. Site History:
    - During the period 1950 through 1965 Crane operated a pentachlorophenol (PCP) wood preservation chemical dip tank. The tank measured 18.5 feet by 6.8 feet by 3.5 feet.
    - Crane personnel reported that the dip tank leaked, but there are no documented records of any releases. The dip tank was removed in 1965.
    - An initial site assessment (ISA) in 1983 recommended no further action (NFA). No soil samples were collected during the ISA.
    - Crane performed preliminary soil sampling in the area of the dip tank and found that a significant risk threat was not evident. Documentation regarding the preliminary soil sampling results cannot be located. It was recommended that the SWMU revert back to RFI process to verify ISA report and preliminary soil sampling results.
    - There are no monitoring wells at SWMU 29.
2. The proposed sampling plan identifies the target parameters to be PCP, dioxins, and furans. Commercial PCP is known to contain micro amounts of certain dioxin and furan congeners. Recognizing that dioxin/furan analysis is expensive, a recommendation was made to first screen soil samples to see if they contain PCP. If PCP is detected in a sample, then that sample would also be submitted for dioxin/furan analysis. Soil samples could be tested in the field using PCP Immunoassay Field Kits. It was also suggested that PCP may have degradation by-products and that these degradation by-products should be identified and also included in the list of target parameters for this field investigation.
3. The sampling plan will include a bias sampling design for soil. Geo-probe soil borings will be collected at nine locations; one upgradient of the dip tank location (southeast), one at the center of the tank location, one at each corner of the tank location, and 3 downgradient (northwest) of the tank location. There will be two soil samples per boring; one surface (0-2 feet bgs) and one subsurface sample (> 2 feet bgs) that will be screened either using an FID or a PCP Immunoassay Test Kit to determine which boring subsurface sample will be submitted to the laboratory for analysis.
4. The soil investigation will also include field measurements of soil parameters such as pH, cation exchange capacity (CEC), total organic carbon (TOC), humic content, and soil moisture to determine the potential for PCP mobility in SWMU 29 soil.

APPENDIX C

LABORATORY STANDARD OPERATING PROCEDURES

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

CAPE FEAR ANALYTICAL, LLC
3306 Kitty Hawk Road, Suite 120
Wilmington, NC 28405
W. Michael Larkins Phone: 910-795-0421
mlarkins@cfanalytical.com

ENVIRONMENTAL

Valid To: May 31, 2012 Certificate Number: 3014.01

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with ISO IEC 17025:2005, the 2003 NELAC Chapter 5 Standard, and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in the DoD Quality Systems Manual for Environmental Laboratories (DoD QSM v4.1)) accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below:

Testing Technologies

High Resolution Gas Chromatography / Mass Spectrometry

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste
2,3,7,8-Tetrachlorodibenzo-p-dioxin	EPA 1613B	EPA 1613B/8290A	EPA 1613B/8290A
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
1,2,3,4,5,6,7,8-Octachlorodibenzo-p-dioxin	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
2,3,7,8-Tetrachlorodibenzofuran	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
1,2,3,7,8-Pentachlorodibenzofuran	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
2,3,4,7,8-Pentachlorodibenzofuran	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
1,2,3,4,7,8-Hexachlorodibenzofuran	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
1,2,3,6,7,8-Hexachlorodibenzofuran	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
2,3,4,6,7,8-Hexachlorodibenzofuran	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
1,2,3,7,8,9-Hexachlorodibenzofuran	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
1,2,3,4,6,7,8-Heptachlorodibenzofuran	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
1,2,3,4,7,8,9-Heptachlorodibenzofuran	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
1,2,3,4,5,6,7,8-Octachlorodibenzofuran	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
Total Tetrachlorodibenzo-p-dioxin	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
Total Pentachlorodibenzo-p-dioxin	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
Total Hexachlorodibenzo-p-dioxin	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
Total Heptachlorodibenzo-p-dioxin	--------------------	EPA 1613B/8290A	EPA 1613B/8290A

Peter Mlnger

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste
Total Tetrachlorodibenzofuran	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
Total Pentachlorodibenzofuran	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
Total Hexachlorodibenzofuran	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
Total Heptachlorodibenzofuran	--------------------	EPA 1613B/8290A	EPA 1613B/8290A
2-Chlorobiphenyl (1)	--------------------	EPA 1668A	EPA 1668A
3-Chlorobiphenyl (2)	--------------------	EPA 1668A	EPA 1668A
4-Chlorobiphenyl (3)	--------------------	EPA 1668A	EPA 1668A
2,2'-Dichlorobiphenyl (4)	--------------------	EPA 1668A	EPA 1668A
2,3-Dichlorobiphenyl (5)	--------------------	EPA 1668A	EPA 1668A
2,3'-Dichlorobiphenyl (6)	--------------------	EPA 1668A	EPA 1668A
2,4-Dichlorobiphenyl (7)	--------------------	EPA 1668A	EPA 1668A
2,4'-Dichlorobiphenyl (8)	--------------------	EPA 1668A	EPA 1668A
2,5-Dichlorobiphenyl (9)	--------------------	EPA 1668A	EPA 1668A
2,6-Dichlorobiphenyl (10)	--------------------	EPA 1668A	EPA 1668A
3,3'-Dichlorobiphenyl (11)	--------------------	EPA 1668A	EPA 1668A
3,4-Dichlorobiphenyl (12)	--------------------	EPA 1668A	EPA 1668A
3,4'-Dichlorobiphenyl (13)	--------------------	EPA 1668A	EPA 1668A
3,5-Dichlorobiphenyl (14)	--------------------	EPA 1668A	EPA 1668A
4,4'-Dichlorobiphenyl (15)	--------------------	EPA 1668A	EPA 1668A
2,2',3-Trichlorobiphenyl (16)	--------------------	EPA 1668A	EPA 1668A
2,2',4-Trichlorobiphenyl (17)	--------------------	EPA 1668A	EPA 1668A
2,2',5-Trichlorobiphenyl (18)	--------------------	EPA 1668A	EPA 1668A
2,2',6-Trichlorobiphenyl (19)	--------------------	EPA 1668A	EPA 1668A
2,3,3'-Trichlorobiphenyl (20)	--------------------	EPA 1668A	EPA 1668A
2,3,4-Trichlorobiphenyl (21)	--------------------	EPA 1668A	EPA 1668A
2,3,4'-Trichlorobiphenyl (22)	--------------------	EPA 1668A	EPA 1668A
2,3,5-Trichlorobiphenyl (23)	--------------------	EPA 1668A	EPA 1668A
2,3,6-Trichlorobiphenyl (24)	--------------------	EPA 1668A	EPA 1668A
2,3',4-Trichlorobiphenyl (25)	--------------------	EPA 1668A	EPA 1668A
2,3',5-Trichlorobiphenyl (26)	--------------------	EPA 1668A	EPA 1668A
2,3',6-Trichlorobiphenyl (27)	--------------------	EPA 1668A	EPA 1668A
2,4,4'-Trichlorobiphenyl (28)	--------------------	EPA 1668A	EPA 1668A
2,4,5-Trichlorobiphenyl (29)	--------------------	EPA 1668A	EPA 1668A
2,4,6-Trichlorobiphenyl (30)	--------------------	EPA 1668A	EPA 1668A
2,4',5-Trichlorobiphenyl (31)	--------------------	EPA 1668A	EPA 1668A
2,4',6-Trichlorobiphenyl (32)	--------------------	EPA 1668A	EPA 1668A
2',3,4-Trichlorobiphenyl (33)	--------------------	EPA 1668A	EPA 1668A
2',3,5-Trichlorobiphenyl (34)	--------------------	EPA 1668A	EPA 1668A
3,3',4-Trichlorobiphenyl (35)	--------------------	EPA 1668A	EPA 1668A
3,3',5-Trichlorobiphenyl (36)	--------------------	EPA 1668A	EPA 1668A
3,4,4'-Trichlorobiphenyl (37)	--------------------	EPA 1668A	EPA 1668A
3,4,5-Trichlorobiphenyl (38)	--------------------	EPA 1668A	EPA 1668A
3,4',5-Trichlorobiphenyl (39)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3'-Tetrachorobiphenyl (40)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4-Tetrachlorobiphenyl (41)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4'-Tetrachlorobiphenyl (42)	--------------------	EPA 1668A	EPA 1668A
2,2',3,5-Tetrachlorobiphenyl (43)	--------------------	EPA 1668A	EPA 1668A
2,2',3,5'-Tetrachlorobiphenyl (44)	--------------------	EPA 1668A	EPA 1668A
2,2',3,6-Tetrachlorobiphenyl (45)	--------------------	EPA 1668A	EPA 1668A
2,2',3,6'-Tetrachlorobiphenyl (46)	--------------------	EPA 1668A	EPA 1668A
2,2'4,4'-Tetrachlorobiphenyl (47)	--------------------	EPA 1668A	EPA 1668A

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste
2,2',4,5-Tetrachlorobiphenyl (48)	--------------------	EPA 1668A	EPA 1668A
2,2',4,5'-Tetrachlorobiphenyl (49)	--------------------	EPA 1668A	EPA 1668A
2,2',4,6-Tetrachlorobiphenyl (50)	--------------------	EPA 1668A	EPA 1668A
2,2',4,6'-Tetrachlorobiphenyl (51)	--------------------	EPA 1668A	EPA 1668A
2,2',5,5'-Tetrachlorobiphenyl (52)	--------------------	EPA 1668A	EPA 1668A
2,2',5,6'-Tetrachlorobiphenyl (53)	--------------------	EPA 1668A	EPA 1668A
2,2',6,6'-Tetrachlorobiphenyl (54)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4-Tetrachlorobiphenyl (55)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4'-Tetrachlorobiphenyl (56)	--------------------	EPA 1668A	EPA 1668A
2,3,3',5-Tetrachlorobiphenyl (57)	--------------------	EPA 1668A	EPA 1668A
2,3,3',5'-Tetrachlorobiphenyl (58)	--------------------	EPA 1668A	EPA 1668A
2,3,3',6-Tetrachlorobiphenyl (59)	--------------------	EPA 1668A	EPA 1668A
2,3,4,4'-Tetrachlorobiphenyl (60)	--------------------	EPA 1668A	EPA 1668A
2,3,4,5-Tetrachlorobiphenyl (61)	--------------------	EPA 1668A	EPA 1668A
2,3,4,6-Tetrachlorobiphenyl (62)	--------------------	EPA 1668A	EPA 1668A
2,3,4',5-Tetrachlorobiphenyl (63)	--------------------	EPA 1668A	EPA 1668A
2,3,4',6-Tetrachlorobiphenyl (64)	--------------------	EPA 1668A	EPA 1668A
2,3,5,6-Tetrachlorobiphenyl (65)	--------------------	EPA 1668A	EPA 1668A
2,3',4,4'-Tetrachlorobiphenyl (66)	--------------------	EPA 1668A	EPA 1668A
2,3',4,5-Tetrachlorobiphenyl (67)	--------------------	EPA 1668A	EPA 1668A
2,3',4,5'-Tetrachlorobiphenyl (68)	--------------------	EPA 1668A	EPA 1668A
2,3',4,6-Tetrachlorobiphenyl (69)	--------------------	EPA 1668A	EPA 1668A
2,3',4',5-Tetrachlorobiphenyl (70)	--------------------	EPA 1668A	EPA 1668A
2,3',4',6-Tetrachlorobiphenyl (71)	--------------------	EPA 1668A	EPA 1668A
2,3',5,5'-Tetrachlorobiphenyl (72)	--------------------	EPA 1668A	EPA 1668A
2,3',5',6-Tetrachlorobiphenyl (73)	--------------------	EPA 1668A	EPA 1668A
2,4,4',5-Tetrachlorobiphenyl (74)	--------------------	EPA 1668A	EPA 1668A
2,4,4',6-Tetrachlorobiphenyl (75)	--------------------	EPA 1668A	EPA 1668A
2',3,4,5-Tetrachlorobiphenyl (76)	--------------------	EPA 1668A	EPA 1668A
3,3',4,4'-Tetrachlorobiphenyl (77)	--------------------	EPA 1668A	EPA 1668A
3,3',4,5-Tetrachlorobiphenyl (78)	--------------------	EPA 1668A	EPA 1668A
3,3',4,5'-Tetrachlorobiphenyl (79)	--------------------	EPA 1668A	EPA 1668A
3,3',5,5'-Tetrachlorobiphenyl (80)	--------------------	EPA 1668A	EPA 1668A
3,4,4',5-Tetrachlorobiphenyl (81)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4-Pentachlorobiphenyl (82)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',5-Pentachlorobiphenyl (83)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',6-Pentachlorobiphenyl (84)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,4'-Pentachlorobiphenyl (85)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,5-Pentachlorobiphenyl (86)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,5'-Pentachlorobiphenyl (87)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,6-Pentachlorobiphenyl (88)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,6'-Pentachlorobiphenyl (89)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4',5-Pentachlorobiphenyl (90)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4',6-Pentachlorobiphenyl (91)	--------------------	EPA 1668A	EPA 1668A
2,2',3,5,5'-Pentachlorobiphenyl (92)	--------------------	EPA 1668A	EPA 1668A
2,2',3,5,6-Pentachlorobiphenyl (93)	--------------------	EPA 1668A	EPA 1668A
2,2',3,5,6'-Pentachlorobiphenyl (94)	--------------------	EPA 1668A	EPA 1668A
2,2',3,5',6-Pentachlorobiphenyl (95)	--------------------	EPA 1668A	EPA 1668A
2,2',3,6,6'-Pentachlorobiphenyl (96)	--------------------	EPA 1668A	EPA 1668A
2,2',3',4,5-Pentachlorobiphenyl (97)	--------------------	EPA 1668A	EPA 1668A
2,2',3',4,6-Pentachlorobiphenyl (98)	--------------------	EPA 1668A	EPA 1668A

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste
2,2',4,4',5-Pentachlorobiphenyl (99)	--------------------	EPA 1668A	EPA 1668A
2,2',4,4',6-Pentachlorobiphenyl (100)	--------------------	EPA 1668A	EPA 1668A
2,2',4,5,5'-Pentachlorobiphenyl (101)	--------------------	EPA 1668A	EPA 1668A
2,2',4,5,6'-Pentachlorobiphenyl (102)	--------------------	EPA 1668A	EPA 1668A
2,2',4,5',6-Pentachlorobiphenyl (103)	--------------------	EPA 1668A	EPA 1668A
2,2',4,6,6'-Pentachlorobiphenyl (104)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4,4'-Pentachlorobiphenyl (105)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4,5-Pentachlorobiphenyl (106)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4',5-Pentachlorobiphenyl (107)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4,5'-Pentachlorobiphenyl (108)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4,6-Pentachlorobiphenyl (109)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4',6-Pentachlorobiphenyl (110)	--------------------	EPA 1668A	EPA 1668A
2,3,3',5,5'-Pentachlorobiphenyl (111)	--------------------	EPA 1668A	EPA 1668A
2,3,3',5,6-Pentachlorobiphenyl (112)	--------------------	EPA 1668A	EPA 1668A
2,3,3',5',6-Pentachlorobiphenyl (113)	--------------------	EPA 1668A	EPA 1668A
2,3,4,4',5-Pentachlorobiphenyl (114)	--------------------	EPA 1668A	EPA 1668A
2,3,4,4',6-Pentachlorobiphenyl (115)	--------------------	EPA 1668A	EPA 1668A
2,3,4,5,6-Pentachlorobiphenyl (116)	--------------------	EPA 1668A	EPA 1668A
2,3,4',5,6-Pentachlorobiphenyl (117)	--------------------	EPA 1668A	EPA 1668A
2,3',4,4',5-Pentachlorobiphenyl (118)	--------------------	EPA 1668A	EPA 1668A
2,3',4,4',6-Pentachlorobiphenyl (119)	--------------------	EPA 1668A	EPA 1668A
2,3',4,5,5'-Pentachlorobiphenyl (120)	--------------------	EPA 1668A	EPA 1668A
2,3',4,5',6-Pentachlorobiphenyl (121)	--------------------	EPA 1668A	EPA 1668A
2',3,3',4,5-Pentachlorobiphenyl (122)	--------------------	EPA 1668A	EPA 1668A
2',3,4,4',5-Pentachlorobiphenyl (123)	--------------------	EPA 1668A	EPA 1668A
2',3,4,5,5'-Pentachlorobiphenyl (124)	--------------------	EPA 1668A	EPA 1668A
2',3,4,5,6'-Pentachlorobiphenyl (125)	--------------------	EPA 1668A	EPA 1668A
3,3',4,4',5-Pentachlorobiphenyl (126)	--------------------	EPA 1668A	EPA 1668A
3,3',4,5,5'-Pentachlorobiphenyl (127)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,4'-Hexachlorobiphenyl (128)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,5-Hexachlorobiphenyl (129)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,5'-Hexachlorobiphenyl (130)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,6-Hexachlorobiphenyl (131)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,6'-Hexachlorobiphenyl (132)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',5,5'-Hexachlorobiphenyl (133)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',5,6-Hexachlorobiphenyl (134)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',5,6'-Hexachlorobiphenyl (135)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',6,6'-Hexachlorobiphenyl (136)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,4',5-Hexachlorobiphenyl (137)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,4',5'-Hexachlorobiphenyl (138)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,4',6-Hexachlorobiphenyl (139)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,4',6'-Hexachlorobiphenyl (140)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,5,5'-Hexachlorobiphenyl (141)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,5,6-Hexachlorobiphenyl (142)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,5,6'-Hexachlorobiphenyl (143)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,5',6-Hexachlorobiphenyl (144)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,6,6'-Hexachlorobiphenyl (145)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4',5,5'-Hexachlorobiphenyl (146)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4',5,6-Hexachlorobiphenyl (147)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4',5,6'-Hexachlorobiphenyl (148)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4',5',6-Hexachlorobiphenyl (149)	--------------------	EPA 1668A	EPA 1668A

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste
2,2',3,4',6,6'-Hexachlorobiphenyl (150)	--------------------	EPA 1668A	EPA 1668A
2,2',3,5,5',6-Hexachlorobiphenyl (151)	--------------------	EPA 1668A	EPA 1668A
2,2',3,5,6,6'-Hexachlorobiphenyl (152)	--------------------	EPA 1668A	EPA 1668A
2,2',4,4',5,5'-Hexachlorobiphenyl (153)	--------------------	EPA 1668A	EPA 1668A
2,2',4,4',5',6-Hexachlorobiphenyl (154)	--------------------	EPA 1668A	EPA 1668A
2,2',4,4',6,6'-Hexachlorobiphenyl (155)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4,4',5-Hexachlorobiphenyl (156)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4,4',5'-Hexachlorobiphenyl (157)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4,4',6-Hexachlorobiphenyl (158)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4,5,5'-Hexachlorobiphenyl (159)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4,5,6-Hexachlorobiphenyl (160)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4,5',6-Hexachlorobiphenyl (161)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4',5,5'-Hexachlorobiphenyl (162)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4',5,6-Hexachlorobiphenyl (163)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4',5',6-Hexachlorobiphenyl (164)	--------------------	EPA 1668A	EPA 1668A
2,3,3',5,5',6-Hexachlorobiphenyl (165)	--------------------	EPA 1668A	EPA 1668A
2,3,4,4',5,6-Hexachlorobiphenyl (166)	--------------------	EPA 1668A	EPA 1668A
2,3',4,4',5,5'-Hexachlorobiphenyl (167)	--------------------	EPA 1668A	EPA 1668A
2,3',4,4',5',6-Hexachlorobiphenyl (168)	--------------------	EPA 1668A	EPA 1668A
3,3',4,4',5,5'-Hexachlorobiphenyl (169)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,4',5-Heptachlorobiphenyl (170)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,4',6-Heptachlorobiphenyl (171)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,5,5'-Heptachlorobiphenyl (172)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,5,6-Heptachlorobiphenyl (173)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,5,6'-Heptachlorobiphenyl (174)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,5',6-Heptachlorobiphenyl (175)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,6,6'-Heptachlorobiphenyl (176)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4',5,6-Heptachlorobiphenyl (177)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',5,5',6-Heptachlorobiphenyl (178)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',5,6,6'-Heptachlorobiphenyl (179)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,4',5,5'-Heptachlorobiphenyl (180)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,4',5,6-Heptachlorobiphenyl (181)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,4',5,6'-Heptachlorobiphenyl (182)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,4',5',6-Heptachlorobiphenyl (183)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,4',6,6'-Heptachlorobiphenyl (184)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,5,5',6-Heptachlorobiphenyl (185)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,5,6,6'-Heptachlorobiphenyl (186)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4',5,5',6-Heptachlorobiphenyl (187)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4',5,6,6'-Heptachlorobiphenyl (188)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4,4',5,5'-Heptachlorobiphenyl (189)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4,4',5,6-Heptachlorobiphenyl (190)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4,4',5',6-Heptachlorobiphenyl (191)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4,5,5',6-Heptachlorobiphenyl (192)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4',5,5',6-Heptachlorobiphenyl (193)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,4',5,5'-Octachlorobiphenyl (194)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,4',5,6-Octachlorobiphenyl (195)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,4',5,6'-Octachlorobiphenyl (196)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,4',6,6'-Octachlorobiphenyl (197)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,5,5',6-Octachlorobiphenyl (198)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,5,5',6'-Octachlorobiphenyl (199)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,5,6,6'-Octachlorobiphenyl (200)	--------------------	EPA 1668A	EPA 1668A

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste
2,2',3,3',4,5',6,6'-Octachlorobiphenyl (201)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',5,5',6,6'-Octachlorobiphenyl (202)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,4',5,5',6-Octachlorobiphenyl (203)	--------------------	EPA 1668A	EPA 1668A
2,2',3,4,4',5,6,6'-Octachlorobiphenyl (204)	--------------------	EPA 1668A	EPA 1668A
2,3,3',4,4',5,5',6-Octachlorobiphenyl (205)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (206)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (207)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (208)	--------------------	EPA 1668A	EPA 1668A
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl (209)	--------------------	EPA 1668A	EPA 1668A
Soxhlet/Dean-Stark Extraction	--------------------	--------------------	EPA 3540C
Continuous Liquid-Liquid Extraction	EPA 3520C	--------------------	--------------------

The American Association for Laboratory Accreditation

World Class Accreditation

Accredited DoD ELAP Laboratory

A2LA has accredited

CAPE FEAR ANALYTICAL, LLC

Wilmington, NC

for technical competence in the field of

Environmental Testing

In recognition of the successful completion of the A2LA evaluation process that includes an assessment of the laboratory's compliance with ISO/IEC 17025:2005, the 2003 NELAC Chapter 5 Standard, and the requirements of the Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in the DoD Quality Systems Manual for Environmental Laboratories (QSM v4.1); accreditation is granted to this laboratory to perform recognized EPA methods as defined on the associated A2LA Environmental Scope of Accreditation. This accreditation demonstrates technical competence for this defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION
CORPORATE SEAL 1978 DISTRICT OF COLUMBIA
A2LA

Presented this 5th day of April 2010.

President & CEO
For the Accreditation Council
Certificate Number 3014.01
Valid to May 31, 2012

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Environmental Scope of Accreditation.

The American Association for Laboratory Accreditation

World Class Accreditation

Accredited DoD ELAP Laboratory

A2LA has accredited

RTI LABORATORIES, INC.

Livonia, MI

for technical competence in the field of

Environmental Testing

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Presented this 15th day of March 2011.

Peter Unger

President & CEO
For the Accreditation Council
Certificate Number 0570.03
Valid to October 31, 2012

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Environmental Scope of Accreditation.

APPENDIX D

SITE-SPECIFIC FIELD STANDARD OPERATING PROCEDURES

APPENDIX D

SOP TABLE OF CONTENTS

STANDARD OPERATING PROCEDURE

SOP-01

SAMPLE LABELING

SAMPLE LABELING

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the procedures to be used for labeling sample containers. Sample labels are used to document the sample ID, date, time, analysis to be performed, preservative, matrix, sampler, and the analytical laboratory. A sample label will be attached to each sample container.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Writing utensil (preferably black pen with indelible ink)
Disposable medical-grade gloves (e.g. latex, nitrile)
Sample log sheets
Required sample containers: All sample containers for analysis by fix-based laboratories will be supplied and deemed certified clean by the laboratory.
Sample labels
Chain-of-custody records
Sealable polyethylene bags
Heavy-duty cooler
Ice

3.0 PROCEDURES

3.1 The following information will be electronically printed on each sample label prior to mobilizing for field activities. Additional "generic" labels will also be printed prior to mobilization to be used for field QC and backups.

- Project number (CTO F272)
- Sample location ID

- Contract Task Order number
- Sample ID
- Matrix
- Preservative
- Analysis to be performed
- Laboratory name

3.2 Select the container(s) that are appropriate for a given sample. Select the sample-specific ID label(s), complete date, time, and sampler name, and affix to the sample container(s).

3.3 Fill the appropriate containers with sample material. Securely close the container lids without overtightening.

3.4 Place the sample container in a sealable polyethylene bag and place in a cooler containing ice.

Example of a sample label is attached at the end of this SOP.

4.0 ATTACHMENTS

1. Sample Label

ATTACHMENT 1

SAMPLE LABEL

Tetra Tech NUS, Inc. 661 Andersen Drive Pittsburgh, 15220 (412)921-7090	**Project:** **Location:** **CTO:**	
Sample No:		**Matrix:**
Date:	**Time:**	**Preserve:**
Analysis:		
Sampled by:		**Laboratory**

STANDARD OPERATING PROCEDURE

SOP-02

SAMPLE IDENTIFICATION NOMENCLATURE

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish a consistent sample nomenclature system that will facilitate subsequent data management at the Naval Support Activity (NSA) Crane. The sample nomenclature system has been devised such that the following objectives can be attained.

- Sorting of data by site, location, or matrix
- Maintenance of consistency (field, laboratory, and database sample numbers)
- Accommodation of all project-specific requirements
- Accommodation of laboratory sample number length constraints
- Ease of sample identification

The NSA Crane Environmental Protection Department must approve any deviations from this procedure.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Pen with indelible ink

Sample tags

Sample container labels

3.0 SAMPLE IDENTIFICATION NOMENCLATURE

3.1 Confirmation Samples

All confirmation samples will be properly labeled with a sample label affixed to the sample container. Each sample will be assigned a unique sample tracking number.

3.1.1 Confirmation Sample numbering Scheme

The sample tracking number will consist of a four- or five-segment alpha-numeric code that identifies the sample's associated Unexploded Ordnance (UXO) site or Area of Concern (AOC), sample type, location, and sample depth. For soil samples, the final four tracking numbers will identify the depth in units of feet below ground surface (bgs) at which the sample was collected (rounded to the nearest foot). For sediment samples, the final four tracking numbers will identify the depth in units of inches bgs at which the sample was collected.

The alphanumeric coding to be used is explained in the following diagram and subsequent definitions:

AN	**AA**	**NNNA**	**NNNN (Soils and Sediment only)**
UXO or AOC Number	Matrix	Sample Location Number and Grab or Composite	Sequential depth interval from freshly exposed surface

Character Type:

A = Alpha

N = Numeric

UXO Number (AN):

X6 = UXO 6

A1 = AOC 1

A2 = AOC 2

A4 = AOC 4

A6 = AOC 6

Matrix Code (AA):

SS = Surface Soil Sample

SB = Subsurface Soil Sample

SD = Sediment Sample

Location Number (NNNA):

Sequential number beginning with “001” for each matrix, followed by a letter indicating grab (G) (or composite [C] sample, if appropriate).

Depth Interval (NNNN):

This code section will be used for soil and sediment samples only. For soil samples, the final four tracking numbers will identify the depth in units of feet. Surface soil samples will be collected from 0- to 2-feet bgs. Subsurface soil samples will be collected at depths greater than 2-feet bgs. For sediment samples, the final four tracking numbers will identify the depth in units of inches. Sediment samples will be collected from 0- to 6-inches below the sediment/water interface.

The depth code is used to note the depth bgs at which a soil or sediment sample is collected. The first two numbers of the four-number code specify the top interval, and the third and fourth specify the bottom interval of the sample depth. The depths will be noted in whole numbers only; further detail, if needed, will be recorded on the sample log sheet, boring log, logbook, etc. (If composite samples are collected: “location” refers to a particular sampling grid represented by a composite sample.

3.1.2 Examples of Confirmation Sample Nomenclature

The first grab surface soil sample collected from UXO 6, sampling location 003, at a depth of 1-foot bgs would be labeled as “X6SS003G0001”.

The composite sediment sample collected from sampling location 002 at AOC 4 would be labeled as A4SD002C0006.

3.3 Field Quality Assurance/Quality Control (QA/QC) Sample Nomenclature

Field QA/QC samples are described in the UFP-SAP. They will be designated using a different coding system than the one used for regular field samples.

3.3.1 QC Sample Numbering

The QC code will consist of a four-segment alpha-numeric code that identifies the sample QC type, the date the sample was collected, and the number of this type of QC sample collected on that date.

AN	AA	NNNNNN	NN
UXO of AOC Number	QC Type	Date	Sequence Number (per day)

The QC types are identified as:

RB = Rinsate Blank
FD = Field Duplicate

The sampling time recorded on the Chain-of-Custody Form, labels, and tags for duplicate samples will be “0000” so that the samples are "blind" to the laboratory. Notes detailing the sample number, time, date, and type will be recorded on the sample log sheets and will document the location of the duplicate sample (sample log sheets are not provided to the laboratory).

3.3.2 Examples of Field QA/QC Sample Nomenclature

The first duplicate of the day at AOC 2 for a surface soil sample collected on August 25, 2009 would be designated as A2FD08250901.

The third duplicate of the day taken at AOC 1 of a surface soil sample collected on September 3, 2009 would be designated as FD09030903.

The first rinsate blank associated with samples collected on September 3, 2009 would be designated as RB09030901.

STANDARD OPERATING PROCEDURE
SOP-03

SAMPLE CUSTODY AND DOCUMENTATION OF FIELD ACTIVITIES

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes the procedures for sample custody and documentation of field sampling and field analyses activities.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

The following logbooks, forms, labels, and equipment are required.

Writing utensil (preferably black pen with indelible ink)
Site logbook
Field logbook
Sample label
Chain-of-Custody Form
Custody seals
Equipment calibration log
Soil and Sediment Sample Log Sheet
Surface Water Sample Log Sheet

3.0 PROCEDURES

This section describes custody and documentation procedures. All entries made into the logbooks, custody documents, logs, and log sheets described in this SOP must be made in indelible ink (black is preferred). No erasures are permitted. If an incorrect entry is made, the entry will be crossed out with a single strike mark, initialed, and dated.

3.1 Site Logbook

The site logbook is a hard-bound, paginated, controlled-distribution record book in which all major on-site activities are documented. At a minimum, the following activities and events will be recorded (daily) in the site logbook:

- All field personnel present
- Arrival/departure of site visitors
- Arrival/departure of equipment
- Start or completion of sampling activities
- Daily on-site activities performed each day
- Sample pickup information
- Health and safety issues
- Weather conditions

The site logbook is initiated at the start of the first on-site activity (e.g., site visit or initial reconnaissance survey). Entries are to be made for every day that on-site activities take place.

The following information must be recorded on the cover of each site logbook:

- Project name
- Project number
- Book number
- Start date
- End date

Information recorded daily in the site logbook need not be duplicated in other field notebooks but must summarize the contents of these other notebooks and refer to specific page locations in these notebooks for detailed information (where applicable). At the completion of each day's entries, the site logbook must be signed and dated by the field operations leader (FOL).

3.2 Field Logbooks

The field logbook is a separate dedicated notebook used by field personnel to document his or her activities in the field. This notebook is hardbound and paginated.

3.3 Sample Labels

Adhesive sample container labels must be completed and applied to every sample container. Information on the label includes the project name, location, sample number, date, time, preservative, analysis, matrix, sampler's initials, and the name of the laboratory performing the analysis.

3.4 Chain-of-Custody Form

The Chain-of-Custody Form (COC) is a multi-part form that is initiated as samples are acquired and accompanies a sample (or group of samples) as it is transferred from person to person. Each COC is numbered. This form must accompany any samples collected for laboratory chemical analysis. A copy of a blank COC form is attached at the end of this SOP.

The FOL must include the name of the laboratory in the upper right hand corner section to ensure that the samples are forwarded to the correct location. If more than one COC is necessary for any cooler, the FOL will indicate "Page __ of __" on each COC. The original (top) signed copy of the COC will be placed inside a sealable polyethylene bag and taped inside the lid of the shipping cooler. Once the samples are received at the laboratory, the sample custodian checks the contents of the cooler(s) against the enclosed COC(s). Any problems are noted on the enclosed COC Form (bottle breakage, discrepancies between the sample labels, COC form, etc.) and will be resolved through communication between the laboratory point-of-contact and the Task Order Manager (TOM). The COC form is signed and retained by the laboratory and becomes part of the sample's corresponding analytical data package.

3.5 Custody Seal

The custody seal is an adhesive-backed label, and it is part of the chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field and sealed in coolers for transit to the laboratory. The custody seals are signed and dated by the samplers and affixed across the opening edges of each cooler (two seals per cooler) containing environmental samples. The laboratory sample custodian will examine the custody seal for evidence of tampering and will notify the Tetra Tech TOM if evidence of tampering is observed.

3.6 Equipment Calibration Log

The Equipment Calibration Log is used to document calibration of measuring equipment used in the field. The Equipment Calibration Log documents that the manufacturer's instructions were followed for calibration of the equipment, including frequency and type of standard or calibration device. An Equipment Calibration Log must be maintained for each electronic measuring device requiring calibration. Entries must be made for each day the equipment is used.

3.7 Sample Log Sheets

The Soil and Sediment Sample Log Sheets are used to document the sampling of soils and sediments (see SOPs-05, 06, and -08). The surface water sample log sheets are used to document the sampling of surface waters (see SOP-07). The groundwater sample log sheets are used to document the sampling of groundwater (see SOP-18).

4.0 ATTACHMENTS

1. Chain-of-Custody Record
2. Equipment Calibration Log
3. Soil and Sediment Sample Log
4. Surface water Sample Log
5. Groundwater Sample Log

ATTACHMENT 1
CHAIN-OF-CUSTODY RECORD

CHAIN OF CUSTODY | **NUMBER** | **PAGE ____ OF ______**

PROJECT NO:	**SITE NAME:**	**PROJECT MANAGER AND PHONE NUMBER**	**LABORATORY NAME AND CONTACT:**
SAMPLERS (SIGNATURE)		**FIELD OPERATIONS LEADER AND PHONE NUMBER**	**ADDRESS**
		CARRIER/WAYBILL NUMBER	**CITY, STATE**

STANDARD TAT ☐
RUSH TAT ☐
☐ **24 hr.** ☐ **48 hr.** ☐ **72 hr.** ☐ **7 day** ☐ **14 day**

CONTAINER TYPE PLASTIC (P) or GLASS (G)
PRESERVATIVE USED

DATE YEAR ____	**TIME**	**SAMPLE ID**	**MATRIX**	**GRAB (G) COMP (C)**	**No. OF CONTAINERS**	***TYPE OF ANALYSIS***								***COMMENTS***

1. RELINQUISHED BY	DATE	TIME	1. RECEIVED BY	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME
COMMENTS					

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

3/99
FORM NO. TtNUS-001

Tetra Tech NUS, Inc.

EQUIPMENT CALIBRATION LOG

PROJECT NAME : ____________________ INSTRUMENT NAME/MODEL: ____________________

SITE NAME: ____________________ MANUFACTURER: ____________________

PROJECT No.: ____________________ SERIAL NUMBER: ____________________

Date of Calibration	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot No.)	Remarks and Comments
			Pre-calibration	Post-calibration	Pre-calibration	Post-calibration		

ATTACHMENT 3

SOIL AND SEDIMENT SAMPLE LOG SHEET

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: ______________________
Project No.: ______________________

[] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other: ______________________
[] QA Sample Type: ______________________

Sample ID No.: ______________
Sample Location: ______________
Sampled By: ______________
C.O.C. No.: ______________

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date:			
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

	Time	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date:				
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

ATTACHMENT 4

SURFACE WATER SAMPLE LOG SHEET

Tetra Tech NUS, Inc. **SURFACE WATER SAMPLE LOG SHEET**

Page___ of ___

Project Site Name: ____________________
Project No.: ____________________

[] Stream
[] Spring
[] Pond
[] Lake
[] Other: ____________________
[] QA Sample Type: ____________________

Sample ID No.: ____________________
Sample Location: ____________________
Sampled By: ____________________
C.O.C. No.: ____________________

Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date:	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	mV
Time:								
Depth:								
Method:								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD **Duplicate ID No.:**

Signature(s):

ATTACHMENT 5

GROUNDWATER SAMPLE LOG SHEET

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: ______________________ Sample ID No.: ______________
Project No.: ______________________ Sample Location: ______________
Sampled By: ______________
[] Domestic Well Data C.O.C. No.: ______________
[] Monitoring Well Data Type of Sample:
[] Other Well Type: ______________________ [] Low Concentration
[] QA Sample Type: ______________________ [] High Concentration

SAMPLING DATA:

Date:	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time:	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	
Method:								

PURGE DATA:

Date:	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method:								
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type:								
Total Well Depth (TD):								
Static Water Level (WL):								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

STANDARD OPERATING PROCEDURE
SOP-04

DECONTAMINATION OF FIELD SAMPLING EQUIPMENT

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes the procedures to be followed when decontaminating non-dedicated field sampling equipment during the field investigations.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Writing utensil (preferably black pen with indelible ink)
Non-latex rubber or plastic gloves
Cotton gloves
Field logbook
Potable water
Deionized water
Isoproponal (optional)
LiquiNox detergent
Brushes, spray bottles, paper towels, etc.
Container to collect and transport decontamination fluids

3.0 DECONTAMINATION PROCEDURES

3.1 Don non-latex and/or cotton gloves and decontaminate sampling equipment (in accordance with the following steps) prior to field sampling and between samples.

3.2 Rinse the equipment with potable water. Rinsing may be conducted by spraying with water from a spray bottle or by dipping. Collect the potable water rinsate into a container.

3.3 Wash the equipment with a solution of LiquiNox detergent. Prepare the LiquiNox wash solution in accordance with the instructions on the LiquiNox container. Collect the LiquiNox wash solution into a container. Use brushes or sprays as appropriate for the equipment. If oily residue has accumulated on the sampling equipment, remove the residue with an isopropanol wash and repeat the LiquiNox wash.

3.4 Rinse the equipment with potable water. Rinsing may be conducted by spraying with water from a spray bottle or by dipping. Collect the potable water rinsate into a container.

3.5 Rinse the equipment with deionized water. Rinsing may be conducted by spraying with water from a spray bottle or by dipping. Collect the deionized water rinsate into a container.

3.6 Remove excess water by air drying, shaking, or by wiping with paper towels as necessary.

3.7 Document decontamination by recording it in the field logbook.

3.8 Containerized decontamination solutions will be managed in accordance with the procedures described in SOP-13 and this UFP SAP.

STANDARD OPERATING PROCEDURE

SOP-05

BOREHOLE ADVANCEMENT AND SOIL CORING FOR SOIL SAMPLING USING DIRECT-PUSH TECHNOLOGY

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the procedures for collecting surface and subsurface soil cores from unconsolidated overburden materials using direct-push technology (DPT) and hand augering techniques at the NSWC Crane facility. For this investigation, a Geoprobe® rig with a Macrocore Sampler will be the type of DPT used.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Cut-resistant non-latex Impermeable Gloves
Cotton gloves
Disposable medical-grade gloves (e.g., latex, nitrile)
Writing utensil
Boring log sheets: A copy of this form is included in SOP-07
Geoprobe® or equivalent DPT equipment
Geoprobe® Macrocore Sampler or equivalent
Geoprobe® Sampling Kit or equivalent
Clear acetate liners: one new liner for each soil core
Stainless Steel Auger Buckets
Stainless Steel Extension Rods
Cross Handle
Required decontamination materials (see SOP-04)
Bentonite pellets

3.0 BOREHOLE ADVANCEMENT AND SOIL SAMPLING USING A GEOPROBE®

DPT will be employed to collect soil cores. DPT refers to sampling tools and sensors that are driven directly into the ground without the use of conventional rotary drilling equipment. DPT typically utilizes hydraulic pressure and/or percussion hammers to advance the sampling tools. Geoprobe® is a manufacturer of a hydraulically powered, percussion/probing machine utilizing DPT to collect subsurface environmental samples.

3.1 Clear the area to be sampled of any surface debris (herbaceous vegetation, twigs, rocks, litter, etc.).

3.2 Place a new clear acetate liner in the detachable Macrocore core barrel and attach the coring device to the Geoprobe® rig.

3.3 Drive the macrocore sampler (lined with acetate) into the ground to a depth of 2 feet using hydraulic pressure. The 0- to 2-foot depth soil interval is considered to be the surface soil.

3.4 Retract the sampler from the borehole and remove the acetate liner and the soil core from the Macrocore barrel.

3.5 Attach the metal trough from the Geoprobe® Sampling Kit firmly to the tailgate of a vehicle. If a vehicle with a tailgate is not available, secure the trough on another suitable surface.

3.6 Place the acetate liner containing the soil core in the trough.

3.7 While wearing cut-resistant gloves (constructed of non-latex over cotton), cut the acetate liner through its entire length using the double-bladed knife that accompanies the Geoprobe® Sampling Kit. Then remove the strip of acetate from the trough to gain access to the collected soils. **CAUTION:** Do not attempt to cut the acetate liner while holding it in your hand.

3.8 Scan the entire length of the soil core for VOCs using the PID. Record the specific depth interval and the associated PID reading on the Boring Log Sheet. Collect a soil VOC sample using Encore samplers from the soil interval that had the highest PID reading. If no above-background PID readings were detected, collect the VOC sample from an interval that is discolored or displays other visual signs of being contaminated. If no visual sign of contamination is evident, collect the soil VOC sample from the center of the core interval (i.e., 1-foot depth).

3.9 Log the soil core on the Boring Log Sheet (see SOP-07).

3.10 Place the soil core in a stainless-steel mixing bowl, homogenize, and collect the remainder of the soil sample aliquots, as described in SOP-08.

3.11 Repeat steps 3.2 through 3.11 for the next depth intervals.

3.12 The depth to bedrock should be recorded on the Boring Log and the estimated moisture content of the soil and the presence or absence of water in the boring should be noted.

3.13 If readings from the PID are all at background levels below field screening criteria, then excess soil core materials will be returned to the hole and tamped. If insufficient soil is available to fill the hole to the ground surface, then bentonite pellets mixed with the soil will be used to backfill the hole.

3.14 If screening instruments indicate that contaminants may be present in the soil materials, then all excess soil core materials will be placed in a plastic bag (or drum if larger quantities). The bag will be tagged identifying the locations and depths from where the soils came from and the date. The bag will then be placed in a 55-gallon drum and stored on site until laboratory analyses of the soil are completed and classification of the soil waste materials can be determined.

3.15 If soil materials from the boring are suspected of being contaminated (see 3.14 above), the soil boring will be backfilled with bentonite pellets up to the ground surface.

3.16 Decontaminate all soil sampling equipment in accordance with SOP-04 before collecting the next sample.

STANDARD OPERATING PROCEDURE

SOP-06

MANAGEMENT OF INVESTIGATION-DERIVED WASTE

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes how investigation-derived waste (IDW) will be collected, segregated, classified, and managed during the field investigations at NSA Crane. The following types of IDW will be generated during this investigation:

- Soil sampling residues
- Monitoring well development and well purge waters
- Decontamination solutions
- Personal protective equipment and clothing (PPE)
- Miscellaneous trash and incidental items

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Health and safety equipment (with PPE)
Hand augers, plastic or stainless steel trowels
Bucket (with collected development/purge water)
Decontamination equipment
Field logbook
Writing utensil (preferably black pen with indelible ink)
Plastic sheeting and/or tarps
55-gallon drums with sealable lids
IDW labels for drums
Plastic garbage bags

3.0 PROCEDURES

Management of IDW includes the collection, segregation, temporary storage, classification, final disposal, and documentation of the waste-handling activities if necessary.

3.1 Liquid Wastes

Liquid wastes that will be generated during the site activities include decontamination solutions from sampling equipment. These wastes will be collected and containerized in a central location at NSA Crane for proper disposal.

3.2 Solid Wastes

Solid wastes that may be generated during site activities include soil and sediment sampling residues. Excess soil core/sampling materials will be returned to the hole and tamped. If insufficient soil is available to fill the hole to the ground surface, then bentonite pellets mixed with the soil will be used to backfill the hole, and hydrated with potable water. Excess sediment sampling materials will be returned to the point of collection. The disposition of this materials will be carried out in a manner such as not to contribute further environmental degradation or pose a threat to public health or safety.

3.3 PPE and Incidental Trash

All PPE wastes and incidental trash materials (e.g., wrapping or packing materials from supply cartons, waste paper) will be decontaminated (if contaminated), double bagged, securely tied shut, and placed in a designated waste receptacle at NSA Crane.

STANDARD OPERATING PROCEDURE
SOP-07 BOREHOLE AND SOIL SAMPLE LOGGING

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the standard procedures and technical guidance on the logging of soil samples.

2.0 FIELD FORMS AND EQUIPMENT

Knife
Ruler (marked in tenths and hundredths of feet)
Boring Log: An example of this form is attached.
Writing utensil (preferably black pen with indelible ink)

3.0 RESPONSIBILITIES

A field geologist or engineer is responsible for supervising all activities and assuring that each soil sample is properly and completely logged.

4.0 PROCEDURES FOR SAMPLE LOGGING

To maintain a consistent classification of soil, it is imperative that the field geologist understands and accurately uses the field classification system described in this SOP. This identification is based on visual examination and manual tests.

4.1 USCS Classification

Soils are to be classified according to the Unified Soil Classification System (USCS). This method of classification is detailed in Figure 1 (attached to this SOP).

This method of classification identifies soil types on the basis of grain size and cohesiveness.

Fine-grained soils, or fines, are smaller than the No. 200 sieve and are of two types: silt (M) and clay (C). Some classification systems define size ranges for these soil particles, but for field classification purposes, they are identified by their respective behaviors. Organic material (O) is a common component of soil but has no distinguishable size range; it is recognized by its composition. The careful study of the USCS will aid in developing the competence and consistency necessary for the classification of soils.

Coarse-grained soils will be divided into categories: rock fragments, sand, or gravel. The terms "sand" and "gravel" not only refer to the size of the soil particles but also to their depositional history. To insure accuracy in description, the term "rock fragments" will be used to indicate angular granular materials resulting from the breakup of rock. The sharp edges that are typically observed indicate little or no transport from their source area; and therefore, the term provides additional information in reconstructing the depositional environment of the soils encountered. When the term "rock fragments" is used, it will be followed by a size designation such as "(1/4 inchΦ-1/2 inchΦ)" or "coarse-sand size" either immediately after the entry or in the remarks column. The USCS classification would not be affected by this variation in terms.

4.2 Color

Soil colors will be described utilizing a single color descriptor preceded, when necessary, by a modifier to denote variations in shade or color mixtures. A soil could therefore be referred to as "gray" or "light gray" or "blue-gray." Because color can be utilized in correlating units between sampling locations, it is important for color descriptions to be consistent from one boring to another.

Colors must be described while the sample is still moist. Soil samples will be broken or split vertically to describe colors. Samplers tend to smear the sample surface, creating color variations between the sample interior and exterior.

The term "mottled" will be used to indicate soils irregularly marked with spots of different colors. Mottling in soils usually indicates poor aeration and lack of good drainage.

4.3 Relative Density and Consistency

To classify the relative density and/or consistency of a soil, the geologist is to first identify the soil type. Granular soils contain predominantly sands and gravels. They are non-cohesive (particles do not adhere well when compressed). Finer-grained soils (silts and clays) are cohesive (particles will adhere together when compressed).

Granular soils are given the USCS classifications GW, GP, GM, SW, SP, SM, GC, or SC (see Figure 1).

The consistency of cohesive soils is determined by performing field tests and identifying the consistency as shown in the following table.

CONSISTENCY FOR COHESIVE SOILS

Consistency	Standard Penetration Resistance (Blows per Foot)	Unconfined Compressive Strength (Tons/Sq. Foot by pocket penetration)	Field Identification
Very soft	0 to 2	Less than 0.25	Easily penetrated several inches by fist.
Soft	2 to 4	0.25 to 0.50	Easily penetrated several inches by thumb.
Medium stiff	4 to 8	0.50 to 1.0	Can be penetrated several inches by thumb with moderate effort.
Stiff	8 to 15	1.0 to 2.0	Readily indented by thumb but penetrated only with great effort.
Very stiff	15 to 30	2.0 to 4.0	Readily indented by thumbnail.
Hard	Over 30	More than 4.0	Indented with difficulty by thumbnail.

Cohesive soils are given the USCS classifications ML, MH, CL, CH, OL, or OH (see Figure 1).

The consistency of cohesive soils is determined by hand by determining the resistance to penetration by the thumb. The thumb determination methods are conducted on a selected sample of the soil, preferably the lowest 0.5 foot of the sample. The sample will be broken in half and the thumb pushed into the end of the sample to determine the consistency. Do not determine consistency by attempting to penetrate a rock fragment. If the sample is decomposed rock, it is classified as a soft decomposed rock rather than a hard soil. One of the other methods will be used in conjunction with it. The designations used to describe the consistency of cohesive soils are shown in the above-listed table.

4.4 Weight Percentages

In nature, soils are consist of particles of varying size and shape and are combinations of the various grain types. The following terms are useful in the description of soil:

Terms of Identifying Proportion of the Component	Defining Range of Percentages by Weight
Trace	0 - 10 percent
Some	11 - 30 percent
Adjective form of the soil type (e.g., sandy)	31 - 50 percent

Examples:

- Silty fine sand: 50 to 69 percent fine sand, 31 to 50 percent silt.
- Medium to coarse sand, some silt: 70 to 80 percent medium to coarse sand, 11 to 30 percent silt.
- Fine sandy silt, trace clay: 50 to 68 percent silt, 31 to 49 percent fine sand, 1 to 10 percent clay.
- Clayey silt, some coarse sand: 70 to 89 percent clayey silt, 11 to 30 percent coarse sand.

4.5 Moisture

Moisture content is estimated in the field according to four categories: dry, moist, wet, and saturated. In dry soil, there appears to be little or no water. Saturated samples obviously have all the water they can hold. Moist and wet classifications are somewhat subjective and often are determined by the individual's judgment. A suggested parameter for this would be calling a soil wet if rolling it in the gloved hand or on a porous surface liberates water (i.e., dirties or muddies the surface). Whatever method is adopted for describing moisture, it is important that the method used by an individual remains consistent throughout an entire field activity.

4.6 Classification of Soil Grain Size for Chemical Analysis

To determine the gross grain size classification (e.g., clay, silt, and sand) from the USCS classification described above, the following table will be used.

Gross Soil Grain Size Classification	USCS Abbreviation	Description
Clay	CL	inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
	CH	inorganic clays of high plasticity, fat clays.
	OH	organic clays of medium to high plasticity, organic silts.
Silt	ML	inorganic silts and very fine sands, rock four, silty or clayey fine sands with slight plasticity.
	OL	organic silts and organic silty clays of low plasticity.
	MH	inorganic silts, micaceous or diatomaceous fine sand or silty soils.
Sand	SW	well graded sands, gravelly sands, little or no fines.
	SP	poorly graded sands, gravelly sands, little or no fines.
	SM	silty sands, sand-silt mixtures.
	SC	clayey sands, sand-clay mixtures.

4.7 Summary of Soil Classification

In summary, soils will be classified in a similar manner by each geologist/engineer at a project site. The hierarchy of classification is as follows:

- Density and/or consistency
- Color
- Plasticity (optional)
- Soil types
- Moisture content
- Other distinguishing features
- Grain size
- Depositional environment

5.0 ATTACHMENTS

1. Figure 1 - Unified Soil Classification System
2. Boring Log

ATTACHMENT 1

FIGURE 1 - UNIFIED SOIL CLASSIFICATION SYSTEM

Unified Soil Classification System

Coarse Grained Soils (more than half of soil > No. 200 sieve)	Gravels (More than half of coarse fraction > no. 4 sieve size)	GW	Well graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM	Sandy gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-silt mixtures
	Sands (More than half of coarse fraction < no. 4 sieve size)	SW	Well graded sands or gravelly sands, little or no fines
		SP	Poorly graded sands or gravelly sands, little or no fines.
		SM	Silty sands, sand-silt mixtures
		SC	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
Fine Grained Soils (more than half of soil < No. 200 sieve)	Silts and Clays LL = < 50	ML	Inorganic silts and very fine sands, rock flour, silty fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays LL = > 50	MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils, elastic silts
		CH	Inorganic silts of high plasticity, fat clays
		OH	Organic clays of high plasticity, organic silty clays, organic silts
Highly Organic Soils		Pt	Peat and other highly organic soils

Grain Size Chart

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size In Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel coarse fine	3" to No. 4 3" to 3/4" 3/4" to No.4	76.2 to 7.76 76.2 to 4.76 19.1 to 4.76
Sand coarse medium fine	No. 4 to No. 200 No.4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
Silt and Clay	Below No. 200	Below 0.074

Relative Density (SPT)

SANDS AND GRAVELS	BLOWS/FOOT
VERY LOOSE	0 – 4
LOOSE	4 – 10
MEDIUM DENSE	10 – 30
DENSE	32 – 50
VERY DENSE	OVER 50

Consistency (SPT)

SILTS AND CLAYS	BLOWS/FOOT
VERY SOFT	0 – 2
SOFT	2 – 4
MEDIUM STIFF	4 – 8
STIFF	8 – 16
VERY STIFF	16 – 22
HARD	OVER 32

ATTACHMENT 2

BORING LOG

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: ____________ BORING No.: ____________
PROJECT NUMBER: ____________ DATE: ____________
DRILLING COMPANY: ____________ GEOLOGIST: ____________
DRILLING RIG: ____________ DRILLER: ____________

					MATERIAL DESCRIPTION					PID/FID Reading (ppm)			
Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	Sample	Sampler BZ	Borehole**	Driller BZ**

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: ______________________________ Drilling Area Background (ppm): ____

Converted to Well: Yes _______ No _______ Well I.D. #: ____________

STANDARD OPERATING PROCEDURE

SOP-08

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the procedures for sample preservation, packaging, and shipping to be used in handling soil and aqueous samples.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Shipping labels
Custody seals
Chain-of-custody (COC) form(s)
Sample containers with preservatives: All sample containers for analysis by fixed-base laboratories will be supplied, with preservatives added (if required) and deemed certified clean by the laboratory.
Sample shipping containers (coolers): All sample shipping containers are supplied by the laboratory.
Packaging material: Bubble wrap, sealable polyethylene bags, strapping tape, etc.

3.0 PROCEDURES FOR SAMPLE PRESERVATION, PACKAGING, AND SHIPPING

3.1 The laboratory provides sample containers with preservative already included (as required) for the analytical parameter for which the sample is to be analyzed. All samples will be held, stored, and shipped at 4°C. This will be accomplished through refrigeration (used to hold samples prior to shipment) and/or ice.

3.2 The sampler shall maintain custody of the samples until the samples are relinquished to another custodian or to the common carrier.

3.3 Check that each sample container is properly labeled, the container lid is securely fastened, and the container is sealed in a polyethylene bag.

3.4 If the container is glass, place the sample container into a bubble-out shipping bag and seal the bag using the self-sealing, pressure sensitive tape supplied with the bag.

3.5 Inspect the insulated shipping cooler. Check for any cracks, holes, broken handles, etc. If the cooler has a drain plug, make certain it is sealed shut, both inside and outside of the cooler. If the cooler is questionable for shipping, the cooler must be discarded.

3.6 Line the cooler with large plastic bag, and line the bottom of the cooler with a layer of bubble wrap. Place the sample containers into the shipping cooler in an upright position (containers will be upright, with the exception of any 40-ml vials). Continue filling the cooler with ice until the cooler is nearly full and the movement of the sample containers is limited.

3.7 Wrap the large plastic bag closed and secure with tape.

3.8 Place the original (top) signed copy of the COC form inside a sealable polyethylene bag. Tape the bag to the inside of the lid of the shipping cooler.

3.9 Close the cooler and seal the cooler with approximately four wraps of strapping tape at each end of the cooler. Prior to wrapping the last wrap of strapping tape, apply a signed and dated custody seal to each side of the cooler (one per side). Cover the custody seal with the last wrap of tape. This will provide a tamper evident custody seal system for the sample shipment.

3.10 Affix shipping labels to each of the coolers, ensuring all of the shipping information is filled in properly. Overnight (e.g., FedEx Priority Overnight) courier services will be used for all sample shipments.

3.11 All samples will be shipped to the laboratory no more than 72 hours after collection. Under no circumstances should sample hold times be exceeded.

STANDARD OPERATING PROCEDURE

SOP-09

GLOBAL POSITIONING SYSTEM

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide the Field Technicians with basic instructions for operating a handheld Global Positioning System (GPS) unit allowing them to set GPS parameters in the receiver, record GPS positions on the field device, and update existing Geographic Information System (GIS) data. This SOP is specific to GIS quality data collection for Trimble-specific hardware and software.

If possible, the Trimble GeoXM or GeoXH Operators Manual should be downloaded onto the operator's personal computer for reference before or while in the field. The manual can be downloaded at http://trl.trimble.com/docushare/dsweb/Get/Document-311749/TerraSyncReferenceManual.pdf

Unless the operator is proficient in the setup and operation of the GPS unit, the Project Manager (or designee) should have the GPS unit shipped to the project-specific contact listed below in the Pittsburgh, Pennsylvania office at least five working days prior to field mobilization so project-specific shape files, data points, background images, and correct coordinate systems can be uploaded into the unit.

Tetra Tech NUS, Inc.
Attn: John Wright
661 Anderson Drive, Bldg #7
Pittsburgh, PA 15220

2.0 REQUIRED EQUIPMENT

The following hardware and software should be utilized for locating and establishing GPS points in the field:

2.1 Required GPS Hardware

- Hand-held GPS Unit capable of sub-meter accuracy (i.e. Trimble GeoXM or Trimble GeoXH). This includes the docking cradle, a/c adapter, stylus, and USB cable for data transfer.

Optional Accessories:

- External antenna
- Range pole
- Hardware clamp (for mounting Geo to range pole)
- GeoBeacon

- Indelible marker
- Non-metallic pin flags for temporary marking of positions

2.2 Required GPS Software

The following software is required to transfer data from the handheld GPS unit to a personal computer:

- Trimble TerraSync version 2.6 or later (pre-loaded onto GPS unit from vendor)

- Microsoft ActiveSync version 4.2 or later. Download to personal computer from: http://www.microsoft.com/windowsmobile/en-us/downloads/eulas/eula_activesync45_1033.mspx?ProductID=76

- Trimble Data Transfer Utility (freeware version 2.1 or later). Download to personal computer from: http://www.trimble.com/datatransfer.shtml

3.0 START-UP PROCEDURES

Prior to utilizing the GPS in the field, ensure the unit is fully charged. The unit may come charged from the vendor, but an overnight charge is recommended prior to fieldwork.

The Geo-series GPS units require a docking cradle for both charging and data transfer. The Geo-series GPS unit is docked in the cradle by first inserting the far domed end in the top of the cradled, then gently seating the contact end into the latch. The power charger is then connected to the cradle at the back end using the twist-lock connector. Attach a USB cable as needed between the cradle (B end) and the laptop/PC (A end).

It is recommended that the user also be familiar and check various Windows Mobile settings. One critical setting is the Power Options. The backlight should be set as needed to conserve power when not in use.

Start Up:

1) Power on the GPS unit by pushing the small green button located on the lower right front of the unit.

2) Utilizing the stylus that came with the GPS unit, launch **TerraSync** from the Windows Operating System by tapping on the start icon located in the upper left hand corner of the screen and then tap on **TerraSync** from the drop-down list.

3) If the unit does not default to the Setup screen, tap the Main Menu (uppermost left tab, just below the Windows icon) and select Setup.

4) If the unit was previously shipped to the Pittsburgh office for setup, you can skip directly to Section 4.0. However, to confirm or change settings, continue on to Section 3.1.

3.1 Confirm Setup Settings

Use the Setup section to confirm the TerraSync software settings. To open the Setup section, tap the Main Menu and select Setup.

1) Coordinate System
   a. Tap on the Coordinate System.
   b. Verify the project specs are correct for your specific project by scrolling through the various settings. Edit as needed and then tap OK; otherwise, tap Cancel to return to Setup Menu. **Note:** It is always best to utilize the Cancel tab rather than the OK tab if no changes are made since configurations are easily changed by mistake.
   c. Tap on the Units.
   d. Verify the user preferences are correct for your specific project by scrolling through the various settings. Edit as needed and then tap OK; otherwise, tap Cancel to return to Setup Menu.
   e. Tap Real-time Settings.
   f. Verify the Real-time Settings are correct for your specific project by scrolling through the various settings. Edit as needed and then tap OK; otherwise, tap Cancel to return to Setup Menu.
   g. The GPS unit is now configured correctly for your specific project.

4.0 ANTENNA CONNECTION

1) If a connection has been properly made with the internal antenna, a satellite icon along with the number of usable satellites will appear at the top of the screen next to the battery icon. If no connection is made (e.g.: no satellite icon), tap on the GPS tab to connect antenna.
2) At this point the GPS unit is ready to begin collecting data.

5.0 COLLECTING NEW DATA IN THE FIELD

1) From the Main Menu select Data.
2) From the Sub Menu (located below the Data tab) select New which will bring up the New Data File menu.
3) An auto-generated filename appears and should be edited for your specific project. If the integral keyboard does not appear, tap the small keyboard icon at the bottom of the screen.
4) After entering the file name, tap Create to create the new file.
5) Confirm antenna height if screen appears. Antenna height is the height that the GPS unit will be held from the ground surface (Typically 3 to 4 feet).
6) The Choose Feature screen appears.

5.1 Collecting Features

1) If not already open, the Collect Feature screen can be opened by tapping the Main Menu and selecting Data. The Sub Menu should default to Collect.
2) **Do not begin the data logging process until you are at the specific location for which you intend to log the data.**
3) A known reference or two should be shot at the beginning and at the end of each day in which the GPS unit is being used. This allows for greater accuracy during post-processing of the data.
4) Upon arriving at the specific location, tap on Point_generic as the Feature Name.
5) Tap Create to begin data logging.
6) In the Comment Box enter sample ID or location-specific information.
7) Data logging can be confirmed by viewing the writing pencil icon in the upper part of the screen. Also, the logging counter will begin. As a Rule of Thumb, accumulate a minimum of 20 readings on the counter, per point, as indicated by the logging counter before saving the GPS data.
8) Once the counter has reached a minimum number of counts (i.e. 20), tap on OK to save the data point to the GPS unit. Confirm the feature. All data points are automatically saved within the GPS unit.
9) Repeat steps 2 through 8, giving each data point a unique name or number.

Note: If the small satellite icon or the pencil icon is blinking, this is an indication the GPS unit is not collecting data. A possible problem may be too few satellites. While still in data collection mode, tap on Main Menu in upper left hand corner of the screen and select Status. Skyplot will display as the default showing the number of available satellites. To increase productivity (number of usable satellites) use the stylus to move the pointer on the productivity and precision line to the left. This will decrease precision, but increase productivity. The precision and productivity of the GPS unit can be adjusted as the number of usable satellites changes throughout the day. To determine if GPS is correctly recording data, see Section 5.2.

5.2 Viewing Data or Entering Additional Data Points to the Current File

1) To view the stored data points in the current file, tap on the Main Menu and select Map. Stored data points for that particular file will appear. Use the +/- and <-/-> icons in lower left hand corner of screen to zoom in/out and to manipulate current view.
2) To return to data collection, tap on the Main Menu and select Data. You are now ready to continue to collect additional data points.

5.3 Viewing Data or Entering Data Points from an Existing File

1) To view data points from a previous file, tap on Main Menu and select Data, then select File Manager from the Sub Menu.
4) Highlight the file you want to view and select Map from the Main Menu.
5) To add data points to this file, tap on Main Menu and select Data. Continue to collect additional data points.

6.0 NAVIGATION

This section provides instructions on navigating to saved data points in an existing file within the GPS unit.

1) From the Main Menu select Map.
2) Using the Select tool, pick the point on the map to where you want to navigate.
3) The location you select will have a box placed around the point.
4) From the Options menu, choose the Set Nav Target (aka set navigation target).
5) The location will now have double blue flags indicating this point is you navigation target.
6) From the Main Menu select Navigation.

7) The dial and data on this page will indicate what distance and direction you need to travel to reach the desired target.
8) Follow the navigation guide until you reach the point you select.
9) Repeat as needed for any map point by going back to Step 1.

7.0 PULLING IN A BACKGROUND FILE

This section provides instructions on pulling in a pre-loaded background file. These files are helpful in visualizing your current location.

1) From the Main Menu select Map, then tap on Layers, select the background file from drop down list.
2) Select the project-specific background file from the list of available files.
3) Once the selected background file appears, the operator can manipulate the screen utilizing the +/- and <-/-> functions at the bottom of the screen.
4) In operating mode, the operator's location will show up on the background file as a floating "x".

8.0 DATA TRANSFER

This section provides instructions on how to transfer stored data on the handheld GPS unit to a personal computer. Prior to transferring data from the GPS unit to a computer, Microsoft ActiveSync and Trimble Data Transfer Utility software must be downloaded to the computer from the links provided in Section 2.2 (Required GPS Software). If a leased computer is utilized in which the operator can not download files, see the Note at the end of Section 8.0.

1) See Attachment A at the end of this SOP for instructions on how to transfer data from the GPS to a personal computer.

Note: If you are unable to properly transfer data from the GPS unit to a personal computer, the unit should be shipped to the project-specific contact listed in Section 1.0 where the data will be transferred and the GPS unit then shipped back to the vendor.

9.0 SHUTTING DOWN

This section provides instruction for properly shutting down the GPS unit.

1) When shutting down the GPS unit for the day, first click on the "X" in the upper right hand corner.

2) You will be prompted to ensure you want to exit TerraSync. Select Yes.
3) Power off the GPS unit by pushing the small green button located on the bottom face of the unit.
4) Place the GPS unit in its cradle to recharge the battery overnight. Ensure the green charge light is visible on the charging cradle.

ATTACHMENT A

How to Transfer Trimble GPS Data between Data Collector and PC
original 11/21/06 (5/1/08 update) – John Wright

Remember – Coordinate System, Datum, and Units are critical!!!

Trimble Data Collection Devices:
Standard rental systems include the Trimble ProXR/XRS backpack and the newer handheld GeoXT or GeoXH units. Some of the older backpack system may come with either a RECON "PDA-style" or a TSCe or TSC1 alpha-numeric style data collector.

The software on all of the above units should be Trimble TerraSync (v 2.53 or higher – current version is 3.20) and to the user should basically look and function similar. The newer units and software versions (which should always be requested when renting) include enhancements for data processing, real-time display functions, and other features.

Data Transfer:
Trimble provides a free transfer utility program to aid in the transfer of GIS and field data. The Data Transfer Utility is a standalone program that will run on a standard office PC or laptop.

To connect a field data collector such as a RECON, GeoXM, GeoXT, GeoXH, or ProXH, you must first have Microsoft ActiveSync installed to allow the PC and the data collector to talk to one another. A standard USB cable is also needed to connect the two devices.

A CD or USB drive is provided with the data collector for use in data transfer. If needed, these programs are also available without charge via the web at:

• **Trimble Data Transfer Utility** (v 1.38) program to download the RECON or GeoXH field data to your PC: http://www.trimble.com/datatransfer.shtml

• **ActiveSync** from Microsoft to connect the data collector to the PC. The latest version (v4.5) can be found at: http://www.microsoft.com/windowsmobile/activesync/default.mspx
(see page 2 for data transfer instructions)

To Transfer Data Collected in the Field:

• Install the Data Transfer and ActiveSync software installed on your PC
• Connect the RECON or GeoXH to your PC via an A/B USB cable (blade end and square end type "HP printer" style)
• ActiveSync should auto-detect the connection and recognize the data collector
• Make sure the data file desired is CLOSED in TerraSync prior to transfer
• Connect via ActiveSync as a guest (not a partnership)
• Run the Trimble Data Transfer Utility program on your PC
• Select "***GIS Datalogger on Windows CE***" or similar selection
• Hit the green connect icon to the right - the far right area should say "***Connected to ....***" if successful
• Select the "***Receive***" data tab (under device)
• Select "***Data***" from file types on the right
• Find the file(s) needed for data transfer. You can sort the data files by clicking on the date/time header
• Select or browse to a C-drive folder you can put this file for emailing
• When the file appears on the list, hit the "***Transfer All***"
• Go to your Outlook or other email, send a message to: John.Wright@tetratech.com (or GIS department)
• Attach the file(s) you downloaded from your C-drive. For each TerraSync data file created you should have a packet of multiple data files. All need to be sent as a group – make sure you attach all files (the number of files may vary – examples include: ssf, obx, obs, gix, giw, gis, gip, gic, dd, and car)

To Transfer GIS Data from PC to the Field Device (must be converted in Pathfinder Office):

• Obtain GIS file(s) desired from GIS Department and have converted to Trimble extension
• Contact John Wright (John.Wright@tetratech.com) if needed for file conversion and upload support
• The GIS file(s) can be quickly converted if requested and sent back to the field user in the needed "Trimble xxx.imp" extension via email – then quickly downloaded from Outlook to your PC for transfer
• Install the Data Transfer and ActiveSync software installed on your PC
• Connect the RECON or GeoXH to your PC via an A/B USB cable (blade end and square end type "HP printer" style)
• ActiveSync should auto-detect the connection and recognize the data collector
• Connect via ActiveSync as a guest (not a partnership)
• Run the Trimble Data Transfer Utility program on your PC
• Select "***GIS Datalogger on Windows CE***" or similar selection
• Hit the green connect icon to the right - the far right area should say "***Connected to ....***" if successful
• Select the "**Send**" data tab (under device)
• Select "**Data**" from file types on the right (you can also send background files)
• Browse to the location of the data on your PC (obtain the file from Pathfinder Office or from the person who converted the data for field use)
• Select the options as appropriate for the name and location of the data file to go on the data collector (usually you can choose main memory or a data storage card)
• When the file(s) appears on the list, hit the "***Transfer All***"
• Run TerraSync on the field device and open the existing data files. Your transferred file should appear (make sure you have selected Main Memory, Default, or Storage Card as appropriate)

APPENDIX E

PSL BACKUP DOCUMENTATION

NSA Crane SWMU XX Human Health Screening Criteria - Surface and Subsurface Soil Samples

Analyte	CAS Number	EPA Regional Screening Level, Residential Soil (1) (mg/kg)	Adjusted EPA Regional Screening Level, Residential Soil (2) (mg/kg)	EPA Regional Screening Level, Migration to Groundwater (1) (mg/kg)	Adjusted EPA Regional Screening Level, Migration to Groundwater (2) (mg/kg)	2009 IDEM RISC Residential Closure Levels for Soil (mg/kg) (3)			Lowest Human Health Criterion	Lowest Human Health Criterion Reference	EPA Regional Screening Level, Industrial Soil (1) (mg/kg)	2009 IDEM RISC Industrial Closure Levels for Soil (mg/kg) (3)		
						Residential Direct Contact	Migration to Groundwater	Residential Default Closure Level				Industrial Direct Contact	Migration to Groundwater	Industrial Default Closure Level
Semivolatile Organic Compounds														
1,2,3- Trichlorobenzene	87-61-6	49 N	4.9 N	0.087	1.7	NA	NA	NA	1.7	RBSSL	490 N	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	62 N(4)	6.2 N(4)	0.0068	0.14	1800	5.3	5.3	0.14	RBSSL	270 N(4)	4900	77	77
1,2-Dichlorobenzene	95-50-1	1900 N	190 N	0.36	7.2	2800	17	17	7.2	RBSSL	9800 N	3900	270	220
1,3-Dichlorobenzene	541-73-1	NA	NA	NA	NA	420	2.3	2.3	2.3	IDEM-RDCL	NA	890	8.9	8.9
1,4-Dichlorobenzene	106-46-7	2.4 C	2.4 C	0.00041	0.0082	42	2.2	2.2	0.0082	RBSSL	12 C	73	3.4	3.4
2,2'-Oxybis(1-chloropropane)	108-60-1	4.6 C	4.6 C	0.00012	0.0024	30	0.027	0.027	0.0024	RBSSL	22 C	61	0.26	0.26
2,3,4,6-Tetrachlorophenol	58-90-2	1800 N	180 N	6.7	130	NA	NA	NA	130	RBSSL	18000 N	NA	NA	NA
2,4,5-Trichlorophenol	95-95-4	6100 N	610 N	14	280	18000	250	250	250	IDEM-RDCL	62000 N	49000	690	690
2,4,6-Trichlorophenol	88-06-2	61 N(4)	6.1 N(4)	0.023 (4)	0.46 (4)	18	0.07	0.07	0.07	IDEM-RDCL	620 N(4)	49	0.2	0.2
2,4-Dichlorophenol	120-83-2	180 N	18 N	0.13	2.6	550	1.1	1.1	1.1	IDEM-RDCL	1800 N	1500	3	3
2,4-Dimethylphenol	105-67-9	1200 N	120 N	0.86	17	3700	9	9	9	IDEM-RDCL	12000 N	9800	25	25
2,4-Dinitrophenol	51-28-5	120 N	12 N	0.082	1.6	370	0.29	0.29	0.29	IDEM-RDCL	1200 N	980	0.82	0.82
2,4-Dinitrotoluene	121-14-2	1.6 C	1.6 C	0.00029	0.0058	NA	NA	NA	0.0058	RBSSL	5.5 C	NA	NA	NA
2,6-Dinitrotoluene	606-20-2	61 N	6.1 N	0.050	1.0	NA	NA	NA	1.0	RBSSL	620 N	NA	NA	NA
2-Chloronaphthalene	91-58-7	6300 N	630 N	15	300	15000	42	42	42	IDEM-RDCL	82000 N	39000	560	560
2-Methylphenol (o-Cresol)	95-48-7	3100 N	310 N	1.5	30	7500	14	14	14	IDEM-RDCL	31000 N	17000	39	39
2-Nitroaniline	88-74-4	610 N	61 N	0.15	3.0	550	0.67	0.67	0.67	IDEM-RDCL	6000 N	1500	1.9	1.9
4,6-Dinitro-2-methylphenol	534-52-1	4.9 N	0.49 N	0.0050	0.10	NA	NA	NA	0.10	RBSSL	49 N	NA	NA	NA
4-Bromophenyl phenyl ether	101-55-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methyl phenol	59-50-7	6100 N	610 N	4.3	86	NA	NA	NA	86	RBSSL	62000 N	NA	NA	NA
4-Chloroanaline	106-47-8	2.4 C	2.40 C	0.00014	0.0028	730	0.97	0.97	0.0028	RBSSL	8.6 C	2000	2.7	2.7
4-Chlorophenyl phenyl ether	7005-72-3	NA	NA	NA	NA	NA	NA	NA	NA	None	NA	NA	NA	NA
4-Methylphenol (p-Cresol)	106-44-5	310 N	31 N	0.15	3.0	910	1.1	1.1	1.1	IDEM-RDCL	3100 N	2500	3	3
4-Nitroaniline	100-01-6	24 C	24 C	0.0014	0.028	NA	NA	NA	0.028	RBSSL	86 C	NA	NA	NA
4-Nitrophenol	100-02-7	NA	NA	NA	NA	NA	NA	NA	NA	None	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	111-91-1	180 N	18 N	0.025	0.50	NA	NA	NA	0.50	RBSSL	1800 N	NA	NA	NA
Bis(2-chloroethyl)ether	111-44-4	0.21 C	0.21 C	0.0000031	0.000062	1.6	0.0007	0.0007	0.000062	RBSSL	1.0 C	3	0.012	0.012
Bis(2-ethylhexyl)phthalate	117-81-7	35 C	35 C	1.1	22	300	3600	300	22	RBSSL	120 C	980	120000	980
Butyl benzyl phthalate	85-68-7	260 C	260 C	0.51	10	37000	6200	310	10	RBSSL	910 C	98000	6200	310
Carbazole	86-74-8	NA	NA	NA	NA	210	5.9	5.9	5.9	IDEM-RDCL	NA	690	20	20
Dibenzofuran	132-64-9	78 N	7.8 N	0.68	13.6	370	4.9	4.9	4.9	IDEM-RDCL	1000 N	980	65	65
Diethyl phthalate	84-66-2	49000 N	4900 N	12	240	150000	450	450	240	RBSSL	490000 N	390000	1300	840
Dimethyl phthalate	131-11-3	49000 N(4)	4900 N(4)	12 (4)	240 (4)	1000000	2000	1100	240	RBSSL	490000 N(4)	1000000	5600	1100
Di-n-butyl phthalate	84-74-2	6100 N	610 N	9.2	184	18000	5000	760	184	RBSSL	62000 N	49000	14000	760
Di-n-octyl phthalate	117-84-0	NA	NA	NA	NA	7300	67000	2000	2000	IDEM-RDCL	NA	20000	67000	2000
Hexachlorobenzene	118-74-1	0.30 C	0.30 C	0.00053	0.011	2.7	2.2	2.2	0.011	RBSSL	1.1 C	8.6	3.9	3.9
Hexachlorobutadiene	87-68-3	61 N(4)	6.1 N(4)	0.0017	0.034	55	24	24	0.034	RBSSL	22 C	150	66	66
Hexachlorocyclopentadiene	77-47-4	370 N	37 N	0.68	14	1100	400	400	14	RBSSL	3700 N	2900	4900	720
Hexachloroethane	67-72-1	61 N(4)	6.1 N(4)	0.0029	0.058	120	2.8	2.8	0.058	RBSSL	620 N(4)	240	7.7	7.7
Isophorone	78-59-1	510 C	510 C	0.023	0.46	4500	5.3	5.3	0.46	RBSSL	1800 C	14000	18	18
Nitrobenzene	98-95-3	4.8 C	4.8 C	0.000079	0.0016	91	0.028	0.028	0.0016	RBSSL	24 C	250	0.34	0.34
N-Nitrosodiphenylamine	86-30-6	99 C	99 C	0.075	1.5	870	9.7	9.7	1.5	RBSSL	350 C	2800	32	32
Pentachlorophenol	87-86-5	0.89 C	0.89 C	0.0017	0.034	20	0.028	0.028	0.028	IDEM-RDCL	9.0 C	54	0.66	0.66
Phenol	108-95-2	18000 N	1800 N	6.3	126	44000	56	56	56	IDEM-RDCL	180000 N	96000	160	160
Polycyclic Aromatic Hydrocarbons														
2-Methylnaphthalene	91-57-6	310 N	31 N	0.75	15	630	3.1	3.1	3.1	IDEM-RDCL	4100 N	1600	42	42
Acenaphthene	83-32-9	3400 N	340 N	22	440	9500	130	130	130	IDEM-RDCL	33000 N	24000	1800	1800
Acenaphthylene	208-96-8	3400 N(5)	340 N(5)	360 (5)	7200 (5)	1100	18	18	18	IDEM-RDCL	170000 N(5)	2800	180	180
Anthracene	120-12-7	17000 N	1700 N	360	7200	47000	2700	2000	1700	R-RSL	170000 N	120000	36000	2000
Benzo(a)anthracene	56-55-3	0.15 C	0.15 C	0.010	0.20	5	19	5	0.15	R-RSL	2.1 C	15	62	15
Benzo(a)pyrene	50-32-8	0.015 C	0.015 C	0.0035	0.070	0.5	8.2	0.5	0.015	R-RSL	0.21 C	1.5	16	1.5
Benzo(b)fluoranthene	205-99-2	0.15 C	0.15 C	0.035	0.70	5	57	5	0.15	R-RSL	2.1 C	15	190	15
Benzo(g,h,i)perylene	191-24-2	1700 N(6)	170 N(6)	120 (6)	2400 (6)	NA	NA	NA	170	R-RSL	17000 N(6)	NA	NA	NA
Benzo(k)fluoranthene	207-08-9	1.5 C	1.5 C	0.35	7.0	50	570	50	1.5	R-RSL	21 C	150	1900	150
Chrysene	218-01-9	15 C	15 C	1.1	22	500	1900	500	15	R-RSL	210 C	1500	6200	1500
Dibenzo(a,h)anthracene	53-70-3	0.015 C	0.015 C	0.011	0.22	0.5	18	0.5	0.015	R-RSL	0.21 C	1.5	60	1.5
Fluoranthene	206-44-0	2300 N	230 N	160	3200	6300	6300	2000	230	R-RSL	22000 N	16000	18000	2000
Fluorene	86-73-7	2300 N	230 N	27	540	6300	170	170	170	IDEM-RDCL	22000 N	16000	2300	2000
Indeno(1,2,3-c,d)pyrene	193-39-5	0.15 C	0.15 C	0.12	2.4	5	160	5	0.15	R-RSL	2.1 C	15	540	15
Naphthalene	91-20-3	3.6 C	3.60 C	0.00047	0.0094	3200	0.7	0.7	0.0094	RBSSL	18 C	8000	170	170

NSA Crane SWMU XX Human Health Screening Criteria - Surface and Subsurface Soil Samples

Analyte	CAS Number	EPA Regional Screening Level, Residential Soil [1] (mg/kg)	Adjusted EPA Regional Screening Level, Residential Soil [2] (mg/kg)	EPA Regional Screening Level, Migration to Groundwater [1] (mg/kg)	Adjusted EPA Regional Screening Level, Migration to Groundwater [2] (mg/kg)	2009 IDEM RISC Residential Closure Levels for Soil (mg/kg) [3]			Lowest Human Health Criterion	Lowest Human Health Criterion Reference	EPA Regional Screening Level, Industrial Soil [1] (mg/kg)	2009 IDEM RISC Industrial Closure Levels for Soil (mg/kg) [3]		
						Residential Direct Contact	Migration to Groundwater	Residential Default Closure Level				Industrial Direct Contact	Migration to Groundwater	Industrial Default Closure Level
Phenanthrene	85-01-8	1700 N[6]	170 N[6]	120 [6]	2400 [6]	470	13	13	13	IDEM-RDCL	17000 N[6]	1200	170	170
Pyrene	129-00-0	1700 N	170 N	120	2400	4700	4600	2000	170	R-RSL	17000 N	12000	13000	2000
TPH (DRO)														
DRO (C8-C28) Diesel Range	NA	NA	NA	NA	NA	3100	230	230	230	IDEM-RDCL	NA	5800	2300	2300
Dioxins/Furans														
1,2,3,4,6,7,8,9-OCDD	3268-87-9	0.015 C[7]	0.015 C[7]	0.00087 [7]	0.017 [7]	NA	NA	NA	0.015	R-RSL	0.06 C[7]	NA	NA	NA
1,2,3,4,6,7,8,9-OCDF	39001-02-0	0.015 C[7]	0.015 C[7]	0.00087 [7]	0.017 [7]	NA	NA	NA	0.015	R-RSL	0.06 C[7]	NA	NA	NA
1,2,3,4,6,7,8-HPCDD	35822-46-9	0.00045 C[7]	0.00045 C[7]	0.000026 [7]	0.00052 [7]	NA	NA	NA	0.00045	R-RSL	0.0018 C[7]	NA	NA	NA
1,2,3,4,6,7,8-HPCDF	67562-39-4	0.00045 C[7]	0.00045 C[7]	0.000026 [7]	0.00052 [7]	NA	NA	NA	0.00045	R-RSL	0.0018 C[7]	NA	NA	NA
1,2,3,4,7,8,9-HPCDF	55673-89-7	0.00045 C[7]	0.00045 C[7]	0.000026 [7]	0.00052 [7]	NA	NA	NA	0.00045	R-RSL	0.0018 C[7]	NA	NA	NA
1,2,3,4,7,8-HXCDD	39227-28-6	0.000045 C([7]	4.5E-05 C[7]	0.0000026 [7]	0.000052 [7]	NA	NA	NA	0.000045	R-RSL	0.00018 C[7]	NA	NA	NA
1,2,3,4,7,8-HXCDF	70648-26-9	0.000045 C[7]	4.5E-05 C[7]	0.0000026 [7]	0.000052 [7]	NA	NA	NA	0.000045	R-RSL	0.00018 C[7]	NA	NA	NA
1,2,3,6,7,8-HXCDD	57653-85-7	0.000045 C[7]	4.5E-05 C[7]	0.0000026 [7]	0.000052 [7]	NA	NA	NA	0.000045	R-RSL	0.00018 C[7]	NA	NA	NA
1,2,3,6,7,8-HXCDF	57117-44-9	0.000045 C[7]	4.5E-05 C[7]	0.0000026 [7]	0.000052 [7]	NA	NA	NA	0.000045	R-RSL	0.00018 C[7]	NA	NA	NA
1,2,3,7,8,9-HXCDD	19408-74-3	0.000045 C[7]	4.5E-05 C[7]	0.0000026 [7]	0.000052 [7]	NA	NA	NA	0.000045	R-RSL	0.00018 C[7]	NA	NA	NA
1,2,3,7,8,9-HXCDF	72918-21-9	0.000045 C[7]	4.5E-05 C[7]	0.0000026 [7]	0.000052 [7]	NA	NA	NA	0.000045	R-RSL	0.00018 C[7]	NA	NA	NA
1,2,3,7,8-PECDD	40321-76-4	0.0000045 C[7]	4.5E-06 C[7]	0.00000026 [7]	0.0000052 [7]	NA	NA	NA	0.0000045	R-RSL	0.000018 C[7]	NA	NA	NA
1,2,3,7,8-PECDF	57117-41-6	0.00015 C[7]	0.00015 C[7]	0.0000087 [7]	0.00017 [7]	NA	NA	NA	0.00015	R-RSL	0.00060 C[7]	NA	NA	NA
2,3,4,6,7,8-HXCDF	60851-34-5	0.000045 C[7]	4.5E-05 C[7]	0.0000026 [7]	0.000052 [7]	NA	NA	NA	0.000045	R-RSL	0.00018 C[7]	NA	NA	NA
2,3,4,7,8-PECDF	57117-31-4	0.000015 C[7]	1.5E-05 C[7]	0.00000087 [7]	0.000017 [7]	NA	NA	NA	0.000015	R-RSL	0.000060 C[7]	NA	NA	NA
2,3,7,8-TCDD	1746-01-6	0.0000045 C	4.5E-06 C	0.00000026	0.0000052	NA	NA	NA	0.0000045	R-RSL	0.000018 C	NA	NA	NA
2,3,7,8-TCDF	51207-31-9	0.000045 C[7]	4.5E-05 C[7]	0.0000026 [7]	0.000052 [7]	NA	NA	NA	0.000045	R-RSL	0.00018 C[7]	NA	NA	NA
Total HpCDD	37871-00-4	NA	NA	NA	NA	NA	NA	NA	NA	None	NA	NA	NA	NA
Total HpCDF	38998-75-3	NA	NA	NA	NA	NA	NA	NA	NA	None	NA	NA	NA	NA
Total HxCDD	34465-46-8	NA	NA	NA	NA	NA	NA	NA	NA	None	NA	NA	NA	NA
Total HxCDF	55684-94-1	NA	NA	NA	NA	NA	NA	NA	NA	None	NA	NA	NA	NA
Total PeCDD	36088-22-9	NA	NA	NA	NA	NA	NA	NA	NA	None	NA	NA	NA	NA
Total PeCDF	30402-15-4	NA	NA	NA	NA	NA	NA	NA	NA	None	NA	NA	NA	NA
Total TCDD	41903-57-5	NA	NA	NA	NA	NA	NA	NA	NA	None	NA	NA	NA	NA
Total TCDF	55722-27-5	NA	NA	NA	NA	NA	NA	NA	NA	None	NA	NA	NA	NA

Notes:

1 - The residential direct contact (R-RSL) and risk-based migration to groundwater soil screening levels (RBSSL) from the USEPA Regions 3, 6, and 9 Regional Screening Levels for Chemical Contaminants at Superfund Sites, November, 2010 available online at http://epa-prgs.ornl.gov/chemicals/index.shtml. The risk-based screening levels are based on a target hazard quotient of 1 for noncarcinogens (denoted with a "N" flag) or an incremental lifetime cancer risk (ILCR) of 1E-6 for carcinogens (denoted with a "C" flag). (Industrial criteria are also presented for information purposes.)

2 - The USEPA R-RSL (November, 2010) residential soil screening level for noncarcinogens adjusted by dividing by 10, equivalent to a target hazard quotient of 0.1. The residential soil screening level for carcinogens (not adjusted) is equivalent to an incremental lifetime cancer risk (ILCR) of 1E-6. The USEPA RBSSL (November, 2010) is adjusted for a dilution attenuation factor (DAF) of 20.

3 - Indiana Department of Environmental Management (IDEM) residential soil direct contact screening levels, migration to groundwater screening levels, and Residential Default Closure Levels from IDEM RISC Technical Guide, January 31, 2006, Appendix 1, revised May 1, 2009. (Industrial criteria are also presented for information purposes.)

4 - One tenth the noncarcinogenic value is less than the carinogenic value; therefore, the noncarcinogenic value is presented.

5 - Value is for diethyl phthalate.

6 - Value is for acenapththene.

7 - Value is for pyrene.

8 - Value is derived by multiplying criteria for 2,3,7,8-TCDD by World Health Organization Toxicity Equivalent Factor.

Abbreviations:

NA - Not applicable or not available
C - Carcinogen
EPA - U.S. Environmental Protection Agency
N - Noncarcinogen
NA - Not available
SSL - Soil Screening Level